



0000106487

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**Transcript Exhibit(s)**

**Docket #(s):** RR-03639A-09-0430

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**Exhibit #:** A1-A5, S1

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Arizona Corporation Commission  
**DOCKETED**

DEC 29 2009

DOCKETED BY	
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**To:** Arizona Corporation Commission Office of  
Railroad Safety  
Attn: Chris Watson  
1200 W. Washington Street  
Phoenix, AZ 85007

**Date:** August 28, 2009

**Subject:** Arizona Corporation Commission  
Application for UPRR Roadway Crossing  
at Williams Field Road (UPRR Folder  
No. 2538-71)

**Attachments:** 1) 8 1/2"x11" conceptual drawing  
2) Construction cost estimate of grade  
separated crossing  
3) Executed agreement between Town of  
Gilbert and UPRR dated 4/22/09  
4) Cooley Station Traffic Impact Study by TASK  
Engineering

**Project:** Recker and Williams Field Road Improvements

**Project Number:** Town of Gilbert CIP ST062 & ST095  
AZTEC Project No. AZE0703  
UPRR Folder No. 2538-71

**From:** Robert Lyons, P.E.

This memo is submitted to the Arizona Corporation Commission (ACC) as an application to request an upgrade to an existing Union Pacific Railroad (UPRR) crossing, on behalf of the Town of Gilbert. Below is information based on the most current ACC application instructions.

**1. Location of crossing**

The project improvements include widening Williams Field Road to a six lane roadway with a 16-foot wide raised median across the UPRR right-of-way. The UPRR and Williams Field Road crossing is approximately 1,600 feet east of the Higley Road centerline. Representatives from the ACC, UPRR, Town of Gilbert, and consultants attended a field meeting on August 27, 2007.

**2. Why the crossing is needed**

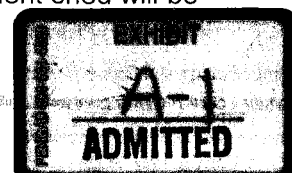
The railroad crossing at Williams Field Road is an existing four lane crossing. Projected traffic volumes on Williams Field Road require the addition of more lanes on Williams Field Road. This project includes widening of the existing crossing.

**3. Why the existing crossing cannot be grade separated**

With the proposed improvements to Williams Field Road, the location of the at-grade crossing remains unchanged. A grade separation would have the following consequences: 1) Impact to 69kV and 230kV overhead power lines currently running parallel to the railroad; 2) Impact to underground utilities in Williams Field Road that cannot support 30 feet of additional embankment needed for a grade-separated crossing. Among these utilities are a 12-inch waterline, a 24-inch gravity sewer line, a proposed 16-inch waterline, and the potential impact to existing gas, power, and telecommunication lines; 3) There is insufficient right-of-way to accommodate the 30-foot high embankment slopes along Williams Field Road; 4) There is inadequate distance between the railroad and the Lyons Gate entrance off of Williams Field Road (approximately 420 feet east of the tracks) and between the railroad and the local business entrance (approximately 420 feet west of the tracks) to raise the roadway grade over the railroad without violating sight-distance requirements; and 5) Elevating Williams Field Road would cause undesirable visual and noise impacts for the adjacent land uses, which include residential.

**4. Type of warning devices to be installed**

The warning devices for east bound and west bound traffic included in the design are as follows: gates with flashing lights will be installed outside the roadway near the sidewalk; cantilever flashing railroad signals will be installed within the median and outside the roadway near the sidewalk; railroad crossing warning signs will be placed per MUTCD, Part 8 standards; and the UPRR equipment shed will be relocated.



**5. Type of warning devices currently installed at crossing**

The warning devices currently installed at the crossing include gates with flashing lights located outside the existing roadway. These will be removed by UPRR when they install the new warning devices described in question 4 above.

**6. Who will maintain the crossing warning devices**

UPRR will own and maintain the physical elements of the crossing (crossing surface, gates, flashing lights). The Town of Gilbert will own and maintain the approaching surface, signing and pavement markings on Williams Field Road.

**7. Who is funding the project**

The Town of Gilbert is funding this project.

Below are responses to additional questions that may also be requested by the ACC:

**8. Provide average daily traffic counts for this location.**

Existing (2008): 12,009 vehicles per day, from the Town of Gilbert traffic count web page, <http://www.ci.gilbert.az.us/traffic/counts08.cfm>

2025: 29,020 vehicles per day (*August 16, 2006; revised November 16, 2006, Cooley Station Traffic Impact Study, by Task Engineering.*)

**9. Please describe the current level of service (LOS) at this intersection, and what the LOS will be with the proposed alterations to the intersection.**

Current LOS: B/C  
Proposed LOS: B/C

**10. Provide any traffic studies done by the road authorities for each area.**

Task Engineering prepared the *August 16, 2006; revised November 16, 2006, Cooley Station Traffic Impact Study*. This report is attached to this memo.

**11. Provide distances in miles to the next public crossing on either side of the proposed project location. Are any of these grade separations?**

The next roadway crossing to the northwest is at Higley Road, which is an at-grade crossing, located approximately 2,000-feet from the Williams Field Road/UPRR crossing.

The next roadway crossing to the southeast is at Recker Road, which is an at-grade crossing, located approximately one mile from the Williams Field Road/UPRR crossing.

**12. How and why was grade separation not decided on at this time? Please provide any studies that were done to support these answers.**

The Town's design consultant evaluated the impacts and estimated costs associated with a grade-separation. The items listed in response to Question No. 3 support the request to improve the existing at-grade crossing at this location.

In addition, the following economic items (<http://www.fra.dot.gov/us/Content/817>, page 35) were considered:

Potential Economic Benefit	Response
Eliminating train/vehicle collisions (including the resultant property damage and medical costs, and liability)	As May 31, 2009, no accidents have been reported at this crossing over the last 20 years per the Federal Railway Administration website, <a href="http://safetydata.fra.dot.gov/OfficeofSafety/publicsite/Query/gxrtop50.aspx">http://safetydata.fra.dot.gov/OfficeofSafety/publicsite/Query/gxrtop50.aspx</a> .
Savings in highway-rail grade crossing surface and crossing signal installation and maintenance costs	This would not be a significant savings because the surface and signal work is about \$1.2M compared to nearly \$28M for a grade separation.
Driver delay cost savings	Based on 1 mile of train, 6 times per day, at 45 mph, driver delay cost savings would be relatively minute (average delay time is 1.3 minutes).
Costs associated with providing increased highway storage capacity (to accommodate traffic backed up by a train)	Storage capacity required for the railroad has not been evaluated and therefore costs savings cannot be determined.
Fuel and pollution mitigation cost savings (from idling queued vehicles)	Based on 1 mile of train, 6 times per day, at 45 mph, fuel and pollution mitigation cost savings would be relatively minute.
Effects of any "spillover" congestion on the rest of the roadway system	Spillover congestion may impact eastbound and westbound queues of adjacent business access west towards Higley Road and business access east towards Recker Road.
The benefits of improved emergency access	See response to question 18.
The potential for closing one or more additional adjacent crossings	Adjacent streets Higley Road and Recker Road cannot be closed because they are major arterials of regional significance and provide access to major destinations (L202 freeway, Higley High School and Higley Elementary Unified School District).
Possible train derailment costs	No derailments have been reported per <a href="http://safetydata.fra.dot.gov/OfficeofSafety/default.aspx">http://safetydata.fra.dot.gov/OfficeofSafety/default.aspx</a> , and therefore associated cost savings are not possible to determine.

**13. If this crossing was grade separated, provide a cost estimate of the project.**

The total estimated construction, design, construction administration, and right-of-way cost is estimated to be \$31,884,881. The details of this estimate are attached to this memo.

**14. Please describe what the surrounding areas are zoned for near this intersection. I.e. Are there going to be new housing developments, industrial parks etc.**

The surrounding area includes a mixture of multi-family/low density residential (MF/L), multi-family/medium density residential (MF/M), single family-6 residential (SF-6), single family-7 residential (SF-7), single family detached residential (SF-D), Gateway Village Center (GVC), Gateway Business Center (GBC), community commercial (CC), general commercial (GC), shopping center (SC) and



public facility/institutions (PF/I), from the Town of Gilbert Planning & Development web page, [http://www.ci.gilbert.az.us/planning/pdf/zoningmap\\_11-08.pdf](http://www.ci.gilbert.az.us/planning/pdf/zoningmap_11-08.pdf). The area east of the crossing is currently being developed and plans have been submitted for "Cooley Station, Village Center and Business Park".

**15. Please supply the following: number of daily train movements through the crossing, speed of the trains, and the type of movements being made (i.e. thru freight or switching). Is this a passenger train route?**

From a 3/31/08 e-mail from Jim Smith/UPRR, the track is used for through freight service and there is an average of 6 trains per day. Maximum train speed is 60 mph. The Union Pacific does not have any plans to construct a second track at this crossing at this time but will need to maintain the ability to add a second track if future expansion is needed. This is not a passenger train route. This information was also confirmed with Aziz Aman/UPRR on 5/28/09.

**16. Please provide the names and locations of all schools (elementary, junior high and high school) within the area of the crossing.**

The crossing is within two school districts, Higley Unified School District No. 60 and Gilbert Unified School District No. 41. Schools located within these districts and a three mile radius of the crossing are listed as follows:

Elementary: Higley Elementary - 3391 E. Vest Avenue  
Chaparral Elementary - 3380 E. Frye Road  
Cortina Elementary - 19680 S. 188<sup>th</sup> Street  
Eagles Aerie School - 17019 S. Greenfield Road  
Gateway Pointe Elementary - 2069 S. De La Torre Drive  
Centennial Elementary - 3507 S. Ranch House Parkway  
Coronado Elementary - 4333 S. Deanza Blvd  
Power Ranch Elementary - 4351 S. Ranch House Parkway  
SanTan Elementary - 3443 E. Calistoga Drive  
Surrey Garden Christian School - 1424 S. Promenade Lane

High School: Higley High School - 4068 E. Pecos Road  
Perry High School - 1919 E. Queen Creek Road  
Williams Field High School - 2076 S. Higley Road  
Surrey Garden Christian School - 1424 S. Promenade Lane

**17. Please provide school bus route information concerning the crossing, including the number of times a day a school bus crosses this crossing.**

Per a phone conversation with Mike McGuire, the Transportation Routing Coordinator for the Higley School District, there are 39 daily trips through this crossing.

**18. Please provide information about any hospitals in the area and whether the crossing is used extensively by emergency service vehicles.**

The main Hospitals and health facilities are as follows:

Hospitals: Gilbert Hospital - 5656 S Power Road  
Mercy Gilbert Medical Center - 3555 S. Val Vista Dr.

Health Facilities: Urgent Care Express - 920 E. Williams Field  
East Valley Urgent Care - 641 W. Warner Road

No data is available for the number of emergency vehicles crossing at this location.

**19. Please provide total cost of improvements to each crossing.**

This project's street improvement cost at the RR crossing is estimated at \$139,000. The UPRR's estimated cost to the crossing is as follows:

• Railroad track & surface:	\$304,579
• Railroad signal:	\$695,104
<hr/>	
• UPRR Sub-Total:	\$999,683
• Roadway Improvements:	\$139,000
<hr/>	
• Total:	\$1,138,683

These costs are based on the agreement dated 4/22/2009.

**20. Provide any information as to whether vehicles carrying hazardous materials utilize this crossing and the number of times a day they might cross it.**

No data is available for the number of vehicles carrying hazardous materials at this location.

**21. Please provide the posted vehicular speed limit for the roadway.**

45 mph

**22. Do any buses (other than school buses) utilize the crossing, and how many times a day do they cross the crossing.**

Valley Metro Route 156 (Chandler Blvd/Williams Field Road) utilizes the crossing an average of 69 times per day, Monday thru Friday, and 63 times per day Saturday and Sunday.

c: Rick Allred/Town of Gilbert  
Project File: AZE0703

## **Attachment 1**

### **8 ½" x 11" Conceptual Drawing**

F.H.W.A. STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	402	1	1	
SECTION	STOPS			
9				



DRIVEWAY

43+00  
42+00  
41+00  
40+00  
39+00  
38+00  
37+00  
36+00  
35+00  
34+00  
33+00  
32+00  
31+00  
30+00  
29+00  
28+00

WILLIAMS FIELD ROAD

COLT DRIVE

UPRR



- PROPOSED DOUBLE ARM STREET LIGHT
- PROPOSED PEDESTRIAN LIGHT
- RAILROAD SIGNAL CROSSING GATE
- RAILROAD SIGNAL CANTILEVER STRUCTURE
- OVERHEAD DISTRIBUTION/TRANSMISSION LINE

GILBERT

ROCKY ROAD & WILLIAMS FIELD ROAD IMPROVEMENTS

ST095  
DATE: 05/01/03  
DRAWN: JLM  
CHECKED: JLM

1 OF 1

R:\Phoenix\Projects\AZ0203-H-R-WF\CAD\Sheets\Exhibits\Roadway\Railroad\WFR\_LUPRR\_Ext.dwg  
Sep 01, 2003 - 11:00am  
JLM

## **Attachment 2**

### **Construction Cost Estimate of Grade Separate Crossing**

**Construction Cost Estimate of Grade Separated Crossing  
Williams Field Road/UPRR Crossing**

**Williams Field Rd-Over-pass @ UPRR crossing**

Item	Quantity	Unit	Unit Cost	Cost
Excavation	3,780.00	CY	\$5.00	\$18,900.00
Fill	151,062.00	CY	\$5.00	\$755,310.00
Bridge	18,000.00	SF	\$200.00	\$3,600,000.00
*Retaining Wall	59,000.00	SF	\$60.00	\$3,540,000.00
Right-of-Way	0.00	SF	\$7.00	\$0.00
Subgrade Preparation	27,000.00	SY	\$3.00	\$81,000.00
Temporary Construction Easement	172,000.00	SF	\$5.00	\$860,000.00
ABC 18"	17,948.00	SY	\$20.00	\$358,960.00
AC 1-1/2"	17,948.00	SY	\$9.00	\$161,532.00
AC 2-1/2"	17,948.00	SY	\$11.00	\$197,428.00
Tack Coat	28.00	TON	\$800.00	\$22,400.00
Vertical Curb & Gutter	4,000.00	LF	\$18.00	\$72,000.00
Vertical Curb	3,400.00	LF	\$15.00	\$51,000.00
Concrete Sidewalk	21,780.00	SF	\$5.00	\$108,900.00
Driveway Entrance	4.00	EA	\$10,000.00	\$40,000.00
Median Nose	4.00	EA	\$1,000.00	\$4,000.00
Median Brick Pavers	28,000.00	SF	\$20.00	\$560,000.00
Landscaping	1.00	LS	\$500,000.00	\$500,000.00
Relocate Sewer Mains	1,100.00	LF	\$120.00	\$132,000.00
Relocate Water Mains	5,200.00	LF	\$100.00	\$520,000.00
Other Utility Relocations	1.00	LS	\$2,000,000.00	\$2,000,000.00
Drainage	1.00	LS	\$200,000.00	\$200,000.00
Signing	1.00	LS	\$20,000.00	\$20,000.00
Striping	1.00	LS	\$15,000.00	\$15,000.00
Traffic Control	1.00	LS	\$300,000.00	\$300,000.00
Impact to adjacent Property Owners	1.00	LS	\$1,000,000.00	\$1,000,000.00
Electrical/Lighting	1.00	LS	\$500,000.00	\$500,000.00
230 kV Relocation	1.00	LS	\$5,000,000.00	\$5,000,000.00
12 kV & 64 kV Relocation	1.00	LS	\$3,000,000.00	\$3,000,000.00
<b>SUB TOTAL - WFR</b>				<b>\$23,618,430.00</b>

**General Items**

Item	Quantity	Unit	Unit Cost	Cost
Mobilization (10%)	1.00	LS	\$2,361,843.00	\$2,361,843.00
Administration (15%)	1.00	LS	\$3,542,765.00	\$3,542,765.00
Design (10%)	1.00	LS	\$2,361,843.00	\$2,361,843.00
<b>SUB TOTAL - GENERAL</b>				<b>\$8,266,451.00</b>
<b>TOTAL</b>				<b>\$31,884,881.00</b>

\* Due to existing and future development, retaining wall is required for entire grade separation

**Attachment 3**

**Executed Agreement between Town of Gilbert and UPRR  
dated 4-22-09**



April 22, 2009

UPRR Folder No. 2538-71

**MR PAUL MOOD  
TOWN OF GILBERT  
50 E CIVIC CENTER DR  
GILBERT AZ 85296**

Dear Mr. Mood:

Attached is your original copy of a Supplemental Agreement, fully executed on behalf of the Railroad Company.

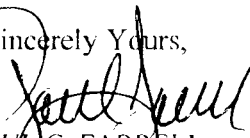
In order to protect the Railroad Company's property as well as for safety reasons, it is imperative that you notify the Railroad Company's Manager of Track Maintenance and the Communications Department:

*Aziz Aman*  
*Manager Public Projects*  
*Union Pacific Railroad Company*  
*2073 East Jade Drive*  
*Chandler, AZ 85286*  
*Phone: 480- 415- 2364*  
*[aaman@up.com](mailto:aaman@up.com)*

*Fiber Optics Hot Line*  
*1-800-336-9193*

If you have any questions, please contact me.

Sincerely Yours,

  
PAUL G. FARRELL  
Senior Manager Contracts  
phone: (402) 544-8620  
e-mail: [pgfarrell@up.com](mailto:pgfarrell@up.com)

Real Estate Department  
UNION PACIFIC RAILROAD COMPANY  
1400 Douglas Street, MS 1690  
Omaha, Nebraska 68179-1690  
fax: 402.501.0340



# SUPPLEMENTAL AGREEMENT

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BETWEEN

UNION PACIFIC RAILROAD COMPANY

AND THE

TOWN OF GILBERT

COVERING THE

IMPROVEMENT, RECONSTRUCTION AND WIDENING OF THE EXISTING  
WILLIAMS FIELDS ROAD AT-GRADE PUBLIC ROAD CROSSING

AT

RAILROAD MILE POST 932.30 - PHOENIX SUBDIVISION  
DOT NO.: 753-711Y

AT OR NEAR

GILBERT,  
MARICOPA COUNTY,  
ARIZONA



UPRR Folder No.: 2538-71  
UPRR Audit No.: S180909

## SUPPLEMENTAL AGREEMENT

Williams Fields Road – DOT No.: 753-711Y  
UPRR Mile Post 932.30 – Phoenix Subdivision  
Gilbert, Maricopa County, Arizona

Contract Number 2009-7003-0309

THIS AGREEMENT is made and entered into as of the 24 day of March, 2009, by and between **UNION PACIFIC RAILROAD COMPANY**, a Delaware corporation, to be addressed at Real Estate Department, 1400 Douglas Street, Mail Stop 1690, Omaha, Nebraska 68179 (the "Railroad") and the **TOWN OF GILBERT**, an a municipal corporation of the State of Arizona (the "Town"),

### RECITALS:

By instrument dated May 24, 1977, Southern Pacific Transportation Company and the County of Maricopa entered into an agreement identified as Railroad's Folder No. 2538-71, UPRR Audit No. S180909 (the "Original Agreement") covering the construction, maintenance, use and grant of rights for the new Williams Field Road at-grade public road crossing, (DOT No. 753-711Y), located at Railroad Mile Post 932.30 on its Phoenix Subdivision near Gilbert, Maricopa County, Arizona (the "Roadway").

The Railroad named herein is successor in interest to the Southern Pacific Transportation Company and the Town now has jurisdiction and control of Williams Field Road and is successor in interest to the County of Maricopa under the Original Agreement.

The Town now desires to undertake as its project (the "Project") the improvement, reconstruction and widening of the Roadway that was constructed under the Original Agreement. The structure, as improved, reconstructed and widened is hereinafter the "Roadway" and where the Roadway crosses the Railroad's property is the "Crossing Area."

The right of way granted by Southern Pacific Transportation Company to the County of Maricopa under the terms of the Original Agreement is not sufficient to allow for the improvements, reconstruction and widening of the road crossing constructed under the Original Agreement. Therefore, under this Agreement, the Railroad will be granting an additional right of way right to the Town to facilitate the improvements, reconstruction and widening of the road crossing. The portion of Railroad's property that Town needs a right to use in connection with the road crossing (including the right of way area covered under the Original Agreement) is shown on the Railroad Location Print marked **Exhibit A**, Detailed Print marked **Exhibit A-1**, described in the Legal Description marked **Exhibit A-2**, and illustrated in the Illustrative Print of the Legal Description marked **Exhibit A-3**, with each exhibit being attached hereto and hereby made a part hereof (the "Crossing Area").

The Railroad and the Town are entering into this Agreement to cover the above.

**AGREEMENT:**

NOW, THEREFORE, it is mutually agreed by and between the parties hereto as follows:

**ARTICLE 1 - LIST OF EXHIBITS**

The exhibits below are attached hereto and hereby made a part hereof.

Exhibit A	Railroad Location Print
Exhibit A-1	Detailed Print
Exhibit A-2	Legal Description
Exhibit A-3	Illustrative Print of Legal Description
Exhibit B	Terms and Conditions
Exhibit B-1	Insurance Requirements
Exhibit C	Railroad's Track & Surface Material Estimate
Exhibit C-1	Railroad's Signal Material Estimate
Exhibit D	Railroad Form of Contractor's Right of Entry Agreement

**ARTICLE 2 - EXHIBITS B AND B-1.**

The general terms and conditions marked **Exhibit B**, and the Contractor's insurance requirements marked **Exhibit B-1**, are attached hereto and hereby made a part hereof.

**ARTICLE 3 - RAILROAD GRANTS RIGHT.**

For and in consideration **SEVENTY-SIX THOUSAND EIGHTY-FOUR DOLLARS (\$76,084.00)** to be paid by the Town to the Railroad upon the execution and delivery of this Agreement and in further consideration of the Town's agreement to perform and abide by the terms of this Agreement including all exhibits, the Railroad hereby grants to the Town the right to establish or reestablish, construct or reconstruct, maintain, repair and renew the road crossing over and across the Crossing Area.

**ARTICLE 4 - DEFINITION OF CONTRACTOR**

For purposes of this Agreement the term "Contractor" shall mean the contractor or contractors hired by the Town to perform any Project work on any portion of the Railroad's property and shall also include the contractor's subcontractors and the contractor's and subcontractor's respective employees, officers and agents.

**ARTICLE 5 - CONTRACTOR'S RIGHT OF ENTRY AGREEMENT - INSURANCE**

- A. If the Town will be hiring a Contractor to perform any work involving the Project (including initial construction and any subsequent relocation or maintenance and repair work), the Town shall require the Contractor to:
- execute the Railroad's then current Contractor's Right of Entry Agreement
  - obtain the then current insurance required in the Contractor's Right of Entry Agreement; and
  - provide such insurance policies, certificates, binders and/or endorsements to the Railroad before allowing any Contractor to commence any work in the Crossing Area



or on any other Railroad property. The Railroad's current insurance requirements are described in **Exhibit B-1**, attached hereto and hereby made a part hereof.

- B. The Railroad's current Contractor's Right of Entry Agreement is marked **Exhibit D**, attached hereto and hereby made a part hereof. The Town confirms that it will inform its Contractor that it is required to execute such form of agreement and obtain the required insurance before commencing any work on any Railroad property. Under no circumstances will the Contractor be allowed on the Railroad's property without first executing the Railroad's Contractor's Right of Entry Agreement and obtaining the insurance set forth therein and also providing to the Railroad the insurance policies, binders, certificates and/or endorsements described therein.
- C. All insurance correspondence, binders, policies, certificates and/or endorsements shall be sent to:
- Senior Manager - Contracts  
Union Pacific Railroad Company  
Real Estate Department  
1400 Douglas Street, Mail Stop 1690  
Omaha, NE 68179-1690  
UPRR Folder No.: 2538-71*
- D. If the Town's own employees will be performing any of the Project work, the Town may self-insure all or a portion of the insurance coverage subject to the Railroad's prior review and approval.

#### **ARTICLE 6 - FEDERAL AID POLICY GUIDE**

- A. If the Town will be receiving any federal funding for the Project:
- the current rules, regulations and provisions of the Federal Aid Policy Guide as contained in 23 CFR 140, Subpart I and 23 CFR 646, Subparts A and B are incorporated into this Agreement by reference, and
  - construction work by the Town and Contractor shall be performed, and any reimbursement to the Railroad for work it performs, shall be made in accordance with the Federal Aid Policy Guide.
- B. If federal funding is involved, as provided in 23 CFR 646.210(b)(2), the Project is of no ascertainable benefit to the Railroad and the Railroad shall not be obligated to pay or contribute to any Project costs.

#### **ARTICLE 7 - WORK TO BE PERFORMED BY THE RAILROAD**

- A. The work to be performed by the Railroad, at the Town's sole cost and expense, is described in the Railroad's Material and Force Account Estimates:
- Railroad's Track & Surface Material Estimate dated January 5, 2009, in the amount of \$304,579.00, marked **Exhibit C**, and
  - Railroad's Signal Material Estimate dated January 7, 2009, in the amount of \$695,104.00, marked **Exhibit C-1**,
- each attached hereto and hereby made a part hereof (collectively the "Estimate"). As set forth in the Estimate, the Railroad's combined estimated cost for the Railroad's work



associated with the Project is (\$999,683.00).

- B. The Railroad, if it so elects, may recalculate and update the Estimate submitted to the Town in the event the Town does not commence construction on the portion of the Project located on the Railroad's property within six (6) months from the date of the Estimate.
- C. The Town acknowledges that the Estimate does not include any estimate of flagging or other protective service costs that are to be paid by the Town or the Contractor in connection with flagging or other protective services provided by the Railroad in connection with the Project. All of such costs incurred by the Railroad are to be paid by the Town or the Contractor as determined by the Railroad and the Town. If it is determined that the Railroad will be billing the Contractor directly for such costs, the Town agrees that it will pay the Railroad for any flagging costs that have not been paid by any Contractor within thirty (30) days of the Contractor's receipt of billing.
- D. The Town agrees to reimburse the Railroad for one hundred percent (100%) of all actual costs incurred by the Railroad in connection with the Project including, but not limited to, actual costs of preliminary engineering review, construction inspection, procurement of materials, equipment rental, manpower and deliveries to the job site and all of the Railroad's normal and customary additives (which shall include direct and indirect overhead costs) associated therewith.

#### ARTICLE 8 - PLANS

- A. The Town, at its expense, shall prepare, or cause to be prepared by others, the detailed plans and specifications and submit such plans and specifications to the Railroad's Assistant Vice President Engineering – Design, or his authorized representative, for review and approval. The plans and specifications shall include all Roadway layout specifications, cross sections and elevations, associated drainage, and other appurtenances.
- B. The final one hundred percent (100%) completed plans that are approved in writing by the Railroad's Assistant Vice President Engineering–Design, or his authorized representative, are hereinafter referred to as the "Plans". The Plans are hereby made a part of this Agreement by reference.
- C. No changes in the Plans shall be made unless the Railroad has consented to such changes in writing.
- D. Notwithstanding the Railroad's approval of the Plans, the Railroad shall not be responsible for the permitting, design, details or construction of the Roadway.

#### ARTICLE 9 - EFFECTIVE DATE; TERM; TERMINATION.

- A. This Agreement shall become effective as of the date first herein written, or the date work commences on the Project, whichever is earlier, and shall continue in full force and effect for as long as the Structure remains on the Railroad's property.
- B. The Railroad, if it so elects, may terminate this Agreement effective upon delivery of written notice to the Town in the event the Town does not commence construction on the portion of the Project located on the Railroad's property within twelve (12) months from the date of this Agreement, or from the date that the Railroad has executed this Agreement and returned it to



the Town for its execution, whichever is applicable.

- C. If the Agreement is terminated as provided above, or for any other reason, the Town shall pay to the Railroad all actual costs incurred by the Railroad in connection with the Project up to the date of termination, including, without limitation, all actual costs incurred by the Railroad in connection with reviewing any preliminary or final Project Plans.

**ARTICLE 10 - CONDITIONS TO BE MET BEFORE TOWN CAN COMMENCE WORK.**

Neither the Town nor the Contractor may commence any work within the Crossing Area or on any other Railroad property until:

- The Railroad and Town have executed this Agreement.
- The Railroad has provided to the Town the Railroad's written approval of the Plans.
- Each Contractor has executed Railroad's Contractor's Right of Entry Agreement and has obtained and/or provided to the Railroad the insurance policies, certificates, binders, and/or endorsements set forth in the Contractor's Right of Entry Agreement.

**ARTICLE 11 - SIGNAL MAINTENANCE.**

The Town agrees to reimburse the Railroad the cost of future maintenance of the automatic grade-crossing protection within thirty (30) days of the Town's receipt of billing.

**ARTICLE 12 - AGREEMENT IS SUPPLEMENTAL TO ORIGINAL AGREEMENT**

This Supplement is supplemental to the Original Agreement, and nothing contained in this Supplement shall be construed as amending or modifying the Original Agreement except as herein specifically provided.

**ARTICLE 13 - SPECIAL PROVISION**

The Town confirms that, under Section 3 of the Original Agreement, the Railroad reserved the right to construct future transportation facilities at this location. Accordingly, the Town agrees that, if the Railroad elects at some future date to place a second track on either side of the existing track at this location, the Railroad has the right to construct such track without obtaining the Town's consent pursuant to the terms and conditions set forth in Section 3 of the Original Agreement.

IN WITNESS WHEREOF, the parties have caused this Agreement to be duly executed in duplicate as of the date first herein written.

**UNION PACIFIC RAILROAD COMPANY**  
(Federal Tax ID #94-6001323)

By \_\_\_\_\_

JAMES P. GADE  
Director Contracts

WITNESS:

Catherine A. Temple

(Seal)

**TOWN OF GILBERT**

By \_\_\_\_\_

Title Steven M. Bertram Village

Pursuant to Resolution/Order No. \_\_\_\_\_  
dated: \_\_\_\_\_, 200\_\_\_\_  
hereto attached.

# EXHIBIT A

To Supplemental Agreement

Cover Sheet for the  
Railroad Location Print





MN (11.1°E)



Exhibit A  
Railroad Location Print

# EXHIBIT A-1

To Supplemental Agreement

Cover Sheet for the  
Detailed Print



# EXHIBIT A-2

To Supplemental Agreement

Cover Sheet for the  
Legal Description

**EXHIBIT A**  
**Legal Description**  
**Right-of-Way**

A parcel of land located in the Southwest Quarter of Section 26 and Northwest Quarter of Section 35, Township 1 South, Range 6 East of the Gila and Salt River Meridian, Maricopa County, Arizona, more particularly described as follows:

Commencing at the Southwest Corner of said Section 26, a Brass cap in handhole, whence the South Quarter Corner of said Section 26, a Brass cap in handhole, bears N 89° 18' 45" E, a distance of 2637.88 feet;

**THENCE** along the South line of said Section 26, N 89° 18' 45" E, a distance of 1432.56 feet to the Westerly line of the Union Pacific Railroad Company Right-of-Way (UPROW), according to an Unrecorded map filed in Right-of-Way Serial No. AZPHX-0086615, and to the **TRUE POINT OF BEGINNING**;

**THENCE** leaving said South line, along said Westerly line, N 53° 36' 28" W, a distance of 149.27 feet to the North line of the South 90.00 feet of said Section 26;

**THENCE** leaving said Westerly line, along said North line, N 89° 18' 45" E, a distance of 331.72 feet to the Easterly line of said UPROW;

**THENCE** leaving said North line, along said Easterly line, S 53° 36' 28" E, a distance of 298.54 feet to the South line of the North 90.00 feet of said Section 35;

**THENCE** leaving said Easterly line, along said South line, S 89° 18' 45" W, a distance of 331.72 feet to said Westerly line;

November 5, 2007  
Page 2 of 2

**THENCE** leaving said South line, along said Westerly line, N 53° 36' 28" W, a distance of 149.27 feet to the **TRUE POINT OF BEGINNING**.

Containing 59,709 square feet (1.37 Ac.) ±.

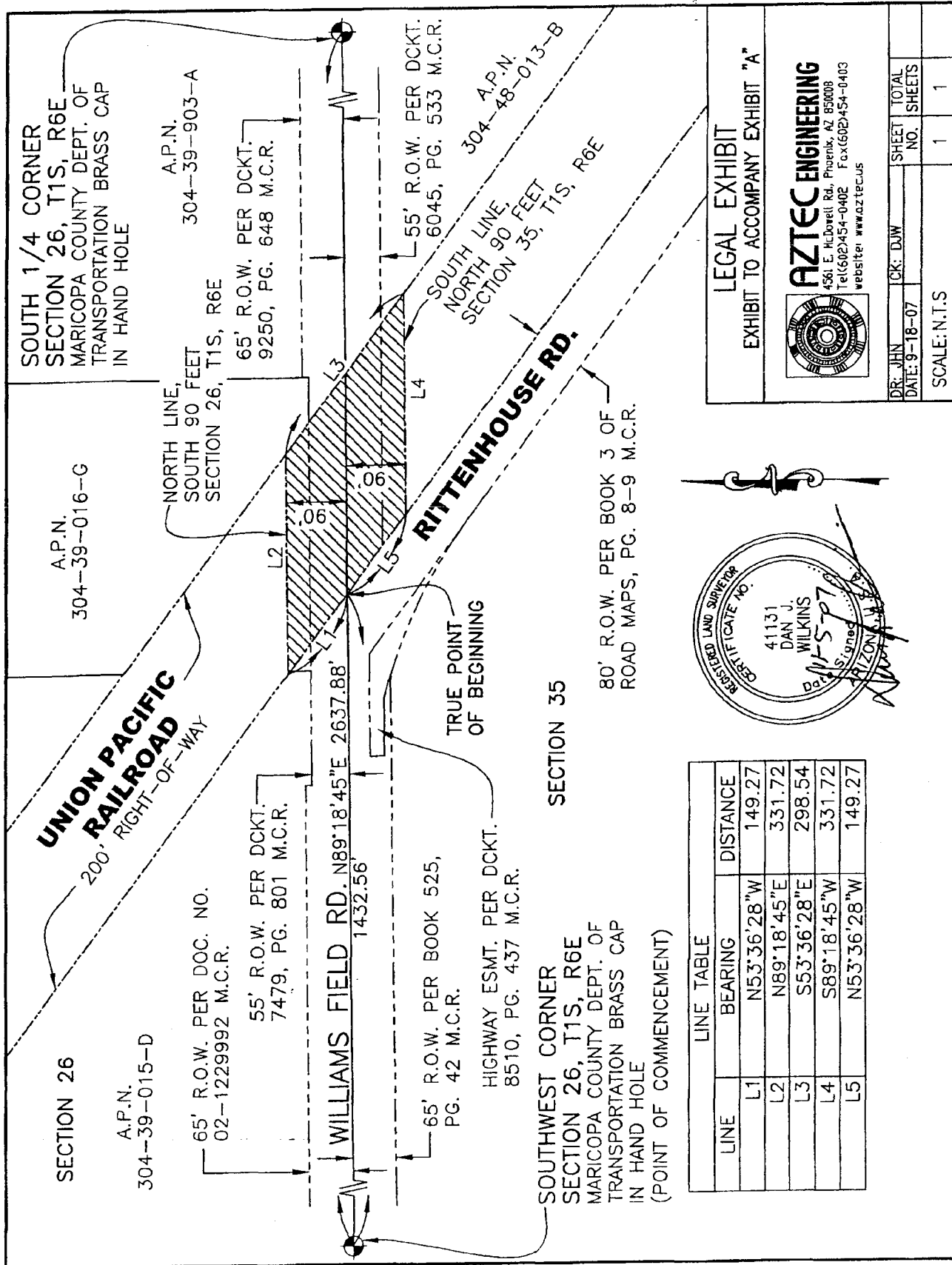
This Description is located within an area surveyed by AZTEC in May-July 2007. And is also based on Maricopa County GDACS. Monumentation as noted in this Description is within acceptable standards (as defined in "Arizona Boundary Survey Minimum Standards") based on said survey.



# EXHIBIT A-3

To Supplemental Agreement

Cover Sheet for the  
Illustrative Print of the Legal Description



RA\Phoenix\Projects\AZ0703 H-R-VFR\Survey\070303B\dwg\0703L02.dwg



# EXHIBIT B

To Supplemental Agreement

Cover Sheet for the  
Terms and Conditions

## EXHIBIT B

### TO SUPPLEMENTAL AGREEMENT

#### TERMS AND CONDITIONS

##### **SECTION 1. CONDITIONS AND COVENANTS**

- a) The Railroad makes no covenant or warranty of title for quiet possession or against encumbrances. The Town shall not use or permit use of the Crossing Area for any purposes other than those described in this Agreement. Without limiting the foregoing, the Town shall not use or permit use of the Crossing Area for railroad purposes, or for gas, oil or gasoline pipe lines. Any lines constructed on the Railroad's property by or under authority of the Town for the purpose of conveying electric power or communications incidental to the Town's use of the property for highway purposes shall be constructed in accordance with specifications and requirements of the Railroad, and in such manner as not adversely to affect communication or signal lines of the Railroad or its licensees now or hereafter located upon said property. No nonparty shall be admitted by the Town to use or occupy any part of the Railroad's property without the Railroad's written consent. Nothing herein shall obligate the Railroad to give such consent.
- b) The Railroad reserves the right to cross the Crossing Area with such railroad tracks as may be required for its convenience or purposes in such manner as not unreasonably to interfere with its use as a public highway. In the event the Railroad shall place tracks upon the Crossing Area, the Town shall, at its sole cost and expense, modify the highway to conform with the rail line.
- c) The right hereby granted is subject to any existing encumbrances and rights (whether public or private), recorded or not, and also to any renewals thereof. The Town shall not damage, destroy or interfere with the property or rights of nonparties in, upon or relating to the railroad property, unless the Town at its own expense settles with and obtains releases from such nonparties.
- d) The Railroad reserves the right to use and to grant to others the right to use the Crossing Area for any purpose not inconsistent with the right hereby granted, including, but not by way of limitation, the right to construct, reconstruct, maintain, operate, repair, alter, renew and replace tracks, facilities and appurtenances on the property; also the right to cross the Crossing Area with all kinds of equipment. The Railroad further reserves the right to attach signal, communication or power lines to any highway facilities located upon the property, provided that such attachments shall comply with Town's specifications and will not interfere with the use of the Crossing Area.
- e) So far as it lawfully may do so, the Town will assume, bear and pay all taxes and assessments of whatsoever nature or kind (whether general, local or special) levied or assessed upon or against the Crossing Area, excepting taxes levied upon and against the property as a component part of the Railroad's operating property.
- f) If any property or rights other than the right hereby granted are necessary for the construction, maintenance and use of the Roadway and its appurtenances, or for the performance of any work in connection with the Project, the Town will acquire all such other property and rights at its own expense and without expense to the Railroad.

##### **SECTION 2. CONSTRUCTION OF ROADWAY**

- a) The Town, at its expense, will apply for and obtain all public authority required by law, ordinance, rule or regulation for the Project, and will furnish the Railroad upon request with satisfactory evidence that such authority has been obtained.
- b) Except as may be otherwise specifically provided herein, the Town, at its expense, will furnish all necessary labor, material and equipment, and shall construct and complete the Roadway and all appurtenances thereof. The appurtenances shall include, without limitation, all necessary and proper highway warning devices (except those installed by the Railroad within its right of way) and all necessary drainage facilities, guard rails or barriers, and right of way fences between the Roadway and the railroad tracks. Upon completion of the Project, the Town shall remove from the Railroad's property all temporary structures and false work, and will leave the Crossing Area in a condition satisfactory to the Railroad.
- c) All construction work of the Town upon the Railroad's property (including, but not limited to, construction of the Roadway and all appurtenances and all related and incidental work) shall be performed and completed in a manner satisfactory to the Assistant Vice President Engineering - Design of the Railroad or his authorized representative and in accordance with the Plans, and other guidelines furnished by the Railroad.
- d) All construction work of the Town shall be performed diligently and completed within a reasonable time, and in any event within three (3) years from the effective date of this Agreement, or within such further period of time as may be specified in writing by the Railroad's Assistant Vice President Engineering - Design. No part of the Project shall be suspended, discontinued or unduly delayed without the Railroad's written consent, and subject to such reasonable conditions as the Railroad may specify. It is understood that the Railroad's tracks at and in the vicinity of the work will be in constant or frequent use during progress of the work and that movement or stoppage of trains, engines or cars may cause delays in the work of the Town. The Town hereby assumes the risk of any such delays and agrees that no claims for damage on account of any delay shall be made against the Railroad.



### SECTION 3. INJURY AND DAMAGE TO PROPERTY

If the Town, in the performance of any work contemplated by this Agreement or by the failure to do or perform anything for which the Town is responsible under the provisions of this Agreement, shall injure, damage or destroy any property of the Railroad or of any other person lawfully occupying or using the property of the Railroad, such property shall be replaced or repaired by the Town at the Town's own expense, or by the Railroad at the expense of the Town, and to the satisfaction of the Railroad's Assistant Vice President Engineering - Design.

### SECTION 4. PAYMENT FOR WORK BY THE RAILROAD

- a) Bills for work and materials shall be paid by the Town within thirty (30) days of its receipt thereof. The Railroad will submit to the Town current bills for all work performed by the Railroad and all flagging and other protective services and devices during progress of the Project (unless flagging is to be billed directly to the Contractor). The Railroad will submit final billing within one hundred and twenty (120) days after completion of the Project, provided the Town advises the Railroad of the commencement of the 120-day period by giving the Railroad written notification of completion of the Project.
- b) The Railroad may contract for the performance of any of its work by other than railroad forces. The Railroad shall notify the Town of the contract price within ninety (90) days after it is awarded. Unless the Railroad's work is to be performed on a fixed price basis, the Town shall reimburse the Railroad for the amount of the contract.

### SECTION 5. MAINTENANCE AND REPAIRS

- a) The Town shall, at its own sole expense, maintain, repair, and renew, or cause to be maintained, repaired and renewed, the entire Crossing Area and Roadway, except the portions between the track tie ends, which shall be maintained by and at the expense of the Railroad.
- b) If, in the future, the Town elects to have the surfacing material between the track tie ends, or between tracks if there is more than one railroad track across the Crossing Area, replaced with paving or some surfacing material other than timber planking, the Railroad, at the Town's expense, shall install such replacement surfacing, and in the future, to the extent repair or replacement of the surfacing is necessitated by repair or rehabilitation of the Railroad's tracks through the Crossing Area, the Town shall bear the expense of such repairs or replacement.

### SECTION 6. CHANGES IN GRADE

If at any time the Railroad shall elect, or be required by competent authority to, raise or lower the grade of all or any portion of the tracks located on the crossing Area, the Town shall, at its own expense, conform the public highway in the Crossing Area to conform with the change of grade of the trackage.

### SECTION 7. REARRANGEMENT OF WARNING DEVICES

If the change or rearrangement of any warning device installed hereunder is necessitated for public or Railroad convenience or on account of improvements for either railroad, highway or both, the parties will apportion the expense incidental thereto between themselves by negotiation, agreement or by the order of a competent authority before the change or rearrangement is undertaken.

### SECTION 8. SAFETY MEASURES; PROTECTION OF RAILROAD COMPANY OPERATIONS

It is understood and recognized that safety and continuity of the Railroad's operations and communications are of the utmost importance; and in order that the same may be adequately safeguarded, protected and assured, and in order that accidents may be prevented and avoided, it is agreed with respect to all of said work of the Town that the work will be performed in a safe manner and in conformity with the following standards:

- a) **Definitions.** All references in this Agreement to the Town shall also include the Contractor and their respective officers, agents and employees, and others acting under its or their authority; and all references in this Agreement to work of the Town shall include work both within and outside of the Railroad's property.
- b) **Compliance With Laws.** The Town shall comply with all applicable federal, state and local laws, regulations and enactments affecting the work. The Town shall use only such methods as are consistent with safety, both as concerns the Town, the Town's agents and employees, the officers, agents, employees and property of the Railroad and the public in general. The Town (without limiting the generality of the foregoing) shall comply with all applicable state and federal occupational safety and health acts and regulations. All Federal Railroad Administration regulations shall be followed when work is performed on the Railroad's premises. If any failure by the Town to comply with any such laws, regulations, and enactments, shall result in any fine, penalty, cost or charge being assessed, imposed or charged against the Railroad, the Town shall reimburse and indemnify the Railroad for any such fine, penalty, cost, or charge, including without limitation attorney's fees, court costs and expenses. The Town further agrees in the event of any such action, upon notice thereof being provided by the Railroad, to defend such action free of cost, charge, or expense to the Railroad.
- c) **No Interference or Delays.** The Town shall not do, suffer or permit anything which will or may obstruct, endanger, interfere with, hinder or delay maintenance or operation of the Railroad's tracks or facilities, or any communication or signal lines, installations



or any appurtenances thereof, or the operations of others lawfully occupying or using the Railroad's property or facilities.

- d) **Supervision.** The Town, at its own expense, shall adequately police and supervise all work to be performed by the Town, and shall not inflict injury to persons or damage to property for the safety of whom or of which the Railroad may be responsible, or to property of the Railroad. The responsibility of the Town for safe conduct and adequate policing and supervision of the Project shall not be lessened or otherwise affected by the Railroad's approval of plans and specifications, or by the Railroad's collaboration in performance of any work, or by the presence at the work site of the Railroad's representatives, or by compliance by the Town with any requests or recommendations made by such representatives. If a representative of the Railroad is assigned to the Project, the Town will give due consideration to suggestions and recommendations made by such representative for the safety and protection of the Railroad's property and operations.
- e) **Suspension of Work.** If at any time the Town's engineers or the Vice President-Engineering Services of the Railroad or their respective representatives shall be of the opinion that any work of the Town is being or is about to be done or prosecuted without due regard and precaution for safety and security, the Town shall immediately suspend the work until suitable, adequate and proper protective measures are adopted and provided.
- f) **Removal of Debris.** The Town shall not cause, suffer or permit material or debris to be deposited or cast upon, or to slide or fall upon any property or facilities of the Railroad; and any such material and debris shall be promptly removed from the Railroad's property by the Town at the Town's own expense or by the Railroad at the expense of the Town. The Town shall not cause, suffer or permit any snow to be plowed or cast upon the Railroad's property during snow removal from the Crossing Area.
- g) **Explosives.** The Town shall not discharge any explosives on or in the vicinity of the Railroad's property without the prior consent of the Railroad's Vice President-Engineering Services, which shall not be given if, in the sole discretion of the Railroad's Vice President-Engineering Services, such discharge would be dangerous or would interfere with the Railroad's property or facilities. For the purposes hereof, the "vicinity of the Railroad's property" shall be deemed to be any place on the Railroad's property or in such close proximity to the Railroad's property that the discharge of explosives could cause injury to the Railroad's employees or other persons, or cause damage to or interference with the facilities or operations on the Railroad's property. The Railroad reserves the right to impose such conditions, restrictions or limitations on the transportation, handling, storage, security and use of explosives as the Railroad, in the Railroad's sole discretion, may deem to be necessary, desirable or appropriate.
- h) **Excavation.** The Town shall not excavate from existing slopes nor construct new slopes which are excessive and may create hazards of slides or falling rock, or impair or endanger the clearance between existing or new slopes and the tracks of the Railroad. The Town shall not do or cause to be done any work which will or may disturb the stability of any area or adversely affect the Railroad's tracks or facilities. The Town, at its own expense, shall install and maintain adequate shoring and cribbing for all excavation and/or trenching performed by the Town in connection with construction, maintenance or other work. The shoring and cribbing shall be constructed and maintained with materials and in a manner approved by the Railroad's Assistant Vice President Engineering - Design to withstand all stresses likely to be encountered, including any stresses resulting from vibrations caused by the Railroad's operations in the vicinity.
- i) **Drainage.** The Town, at the Town's own expense, shall provide and maintain suitable facilities for draining the Structure and its appurtenances, and shall not suffer or permit drainage water therefrom to flow or collect upon property of the Railroad. The Town, at the Town's own expense, shall provide adequate passageway for the waters of any streams, bodies of water and drainage facilities (either natural or artificial, and including water from the Railroad's culvert and drainage facilities), so that said waters may not, because of any facilities or work of the Town, be impeded, obstructed, diverted or caused to back up, overflow or damage the property of the Railroad or any part thereof, or property of others. The Town shall not obstruct or interfere with existing ditches or drainage facilities.
- j) **Notice.** Before commencing any work, the Town shall provide at least ten (10) days prior notice (excluding weekends and holidays) to the Railroad's Manager-Track Maintenance.
- k) **Fiber Optic Cables.** Fiber optic cable systems may be buried on the Railroad's property. Protection of the fiber optic cable systems is of extreme importance since any break could disrupt service to users resulting in business interruption and loss of revenue and profits. Town shall telephone the Railroad during normal business hours (7:00 a.m. to 9:00 p.m. Central Time, Monday through Friday, except holidays) at 1-800-336-9193 (also a 24-hour, 7-day number for emergency calls) to determine if fiber optic cable is buried anywhere on the Railroad's premises to be used by the Town. If it is, Town will telephone the telecommunications company(ies) involved, arrange for a cable locator, and make arrangements for relocation or other protection of the fiber optic cable prior to beginning any work on the Railroad's premises.

## SECTION 9. INTERIM WARNING DEVICES

If at anytime it is determined by a competent authority, by the Town, or by agreement between the parties, that new or improved train activated warning devices should be installed at the Crossing Area, the Town shall install adequate temporary warning devices or signs and impose appropriate vehicular control measures to protect the motoring public until the new or improved devices have been installed.



**SECTION 10. OTHER RAILROADS**

All protective and indemnifying provisions of this Agreement shall inure to the benefit of the Railroad and any other railroad company lawfully using the Railroad's property or facilities.

**SECTION 11. REMEDIES FOR BREACH OR NONUSE**

- a) If the Town shall fail, refuse or neglect to perform and abide by the terms of this Agreement, the Railroad, in addition to any other rights and remedies, may perform any work which in the judgment of the Railroad is necessary to place the highway and appurtenances in such condition as will not menace, endanger or interfere with the Railroad's facilities or operations or jeopardize the Railroad's employees; and the Town will reimburse the Railroad for the expenses thereof.
- b) Nonuse by the Town of the Crossing Area for public highway purposes continuing at any time for a period of eighteen (18) months shall, at the option of the Railroad, work a termination of this Agreement and of all rights of the Town hereunder.
- c) The Town will surrender peaceable possession of the Crossing Area and Roadway upon termination of this Agreement. Termination of this Agreement shall not affect any rights, obligations or liabilities of the parties, accrued or otherwise, which may have arisen prior to termination.

**SECTION 12. MODIFICATION - ENTIRE AGREEMENT**

No waiver, modification or amendment of this Agreement shall be of any force or effect unless made in writing, signed by the Town and the Railroad and specifying with particularity the nature and extent of such waiver, modification or amendment. Any waiver by the Railroad of any default by the Town shall not affect or impair any right arising from any subsequent default. This Agreement and Exhibits attached hereto and made a part hereof constitute the entire understanding between the Town and the Railroad and cancel and supersede any prior negotiations, understandings or agreements, whether written or oral, with respect to the work or any part thereof.

**SECTION 13. ASSIGNMENT; SUCCESSORS AND ASSIGNS**

This Agreement shall not be assigned without the written consent of the Railroad. Subject hereto, this Agreement shall be binding upon and inure to the benefit of the parties hereto and their successors and assigns.

# EXHIBIT B-1

To Supplemental Agreement

Cover Sheet for the  
Insurance Requirements



## EXHIBIT B-1

### TO SUPPLEMENTAL AGREEMENT

### CONTRACT INSURANCE REQUIREMENTS

Contractor shall, at its sole cost and expense, procure and maintain during the life of this Agreement (except as otherwise provided in this Agreement) the following insurance coverage:

- A. **Commercial General Liability Insurance.** Commercial general liability (CGL) with a limit of not less than \$5,000,000 each occurrence and an aggregate limit of not less than \$10,000,000. CGL insurance must be written on ISO occurrence form CG 00 01 12 04 (or a substitute form providing equivalent coverage).

The policy must also contain the following endorsement, which must be stated on the certificate of insurance:

- Contractual Liability Railroads ISO form CG 24 17 10 01 (or a substitute form providing equivalent coverage) showing "Union Pacific Railroad Company Property" as the Designated Job Site.

- B. **Business Automobile Coverage Insurance.** Business auto coverage written on ISO form CA 00 01 (or a substitute form providing equivalent liability coverage) with a combined single limit of not less \$5,000,000 for each accident.

The policy must contain the following endorsements, which must be stated on the certificate of insurance:

- Coverage For Certain Operations In Connection With Railroads ISO form CA 20 70 10 01 (or a substitute form providing equivalent coverage) showing "Union Pacific Property" as the Designated Job Site.
- Motor Carrier Act Endorsement - Hazardous materials clean up (MCS-90) if required by law.

- C. **Workers Compensation And Employers Liability Insurance.** Coverage must include but not be limited to:

- Contractor's statutory liability under the workers' compensation laws of the state(s) affected by this Agreement.
- Employers' Liability (Part B) with limits of at least \$500,000 each accident, \$500,000 disease policy limit \$500,000 each employee.

If Contractor is self-insured, evidence of state approval and excess workers compensation coverage must be provided. Coverage must include liability arising out of the U. S. Longshoremen's and Harbor Workers' Act, the Jones Act, and the Outer Continental Shelf Land Act, if applicable.

- D. **Railroad Protective Liability Insurance.** Contractor must maintain Railroad Protective Liability insurance written on ISO occurrence form CG 00 35 12 04 (or a substitute form providing equivalent coverage) on behalf of Railroad as named insured, with a limit of not less than \$2,000,000 per occurrence and an aggregate of \$6,000,000. A binder stating the policy is in place must be submitted to Railroad before the work may be commenced and until the original policy is forwarded to Railroad.

- E. **Umbrella Or Excess Insurance.** If Contractor utilizes umbrella or excess policies, these policies must "follow form" and afford no less coverage than the primary policy.

#### Other Requirements

- F. All policy(ies) required above (except worker's compensation and employers liability) must include Railroad as "Additional Insured" using ISO Additional Insured Endorsements CG 20 26, and CA 20 48 (or substitute forms providing equivalent coverage). The coverage provided to Railroad as additional insured shall, to the extent provided under ISO Additional Insured Endorsement CG 20 26, and CA 20 48 provide coverage for Railroad's negligence whether sole or partial, active or passive, and shall not be limited by Contractor's liability under the indemnity provisions of this Agreement.
- G. Punitive damages exclusion, if any, must be deleted (and the deletion indicated on the certificate of insurance), unless:
- insurance coverage may not lawfully be obtained for any punitive damages that may arise under this agreement, or
  - all punitive damages are prohibited by all states in which this agreement will be performed.
- H. Contractor waives all rights against Railroad and its agents, officers, directors and employees for recovery of damages to the extent these damages are covered by the workers compensation and employers liability or commercial umbrella or excess liability insurance obtained by Contractor required by this agreement.
- I. Prior to commencing the work, Contractor shall furnish Railroad with a certificate(s) of insurance, executed by a duly authorized representative of each insurer, showing compliance with the insurance requirements in this Agreement.

- J. All insurance policies must be written by a reputable insurance company acceptable to Railroad or with a current Best's Insurance Guide Rating of A- and Class VII or better, and authorized to do business in the state(s) in which the work is to be performed.
- K. The fact that insurance is obtained by Contractor or by Railroad on behalf of Contractor will not be deemed to release or diminish the liability of Contractor, including, without limitation, liability under the indemnity provisions of this Agreement. Damages recoverable by Railroad from Contractor or any third party will not be limited by the amount of the required insurance coverage.



# EXHIBIT C

To Supplemental Agreement

Cover Sheet for the  
Railroad's Track & Surface Material Estimate

DATE: 2009-01-05

ESTIMATE OF MATERIAL AND FORCE ACCOUNT WORK  
BY THE  
UNION PACIFIC RAILROAD

THIS ESTIMATE GOOD FOR 6 MONTHS EXPIRATION DATE IS :2009-07-06

DESCRIPTION OF WORK:

RECOLLECT ROAD CROSSING - PHOENIX SUB - MP 932.30 - WILLIAMS FIELD RD.  
100% RECOLLECT FROM TOWN OF GILBERT, AZ. USING FEDERAL ADDITIVES WITH  
INDIRECT AND OVERHEAD CONSTRUCTION COST, 205%.  
1 XING LOCATION = 160 TF OF CONCRETE CROSSING.  
3 CARS OF BALLAST,

PTD: 60171 AWO: 85363 MP,SUBDIV: 932.30, PHOENIX  
SERVICE UNIT: 16 CITY: HIGLEY STATE: AZ

DESCRIPTION	QTY	UNIT	LABOR	MATERIAL	RECOLL	UPRR	TOTAL
<b>ENGINEERING WORK</b>							
ENGINEERING			10000		10000		10000
LABOR ADDITIVE 205%			20500		20500		20500
<b>TOTAL ENGINEERING</b>			<b>30500</b>		<b>30500</b>		<b>30500</b>
<b>SIGNAL WORK</b>							
LABOR ADDITIVE 205%			2084		2084		2084
SALES TAX				2	2		2
SIGNAL			1017	69	1086		1086
<b>TOTAL SIGNAL</b>			<b>3101</b>	<b>71</b>	<b>3172</b>		<b>3172</b>
<b>TRACK &amp; SURFACE WORK</b>							
BALAST	3.00	CL	2280	2282	4562		4562
BILL PREP				920	920		920
ENVIRONMENTAL PERMITS				1	1		1
FIELD WELD			419		419		419
HOMELINE FREIGHT				900	900		900
LABOR ADDITIVE 205%			100953		100953		100953
MATL STORE EXPENSE				533	533		533
OTM			3280	3174	6454		6454
RAIL	400.00	LF	4439	8644	13083		13083
RDXING	160.00	TF	20354	32685	53039		53039
SALES TAX				2262	2262		2262
TRK-SURF,LIN			8556		8556		8556
WELD			13575	254	13829		13829
XTIE	110.00	FA	27808	9588	37396		37396
10% CONTINGENCY				28000	28000		28000
<b>TOTAL TRACK &amp; SURFACE</b>			<b>181664</b>	<b>89243</b>	<b>270907</b>		<b>270907</b>
<b>LABOR/MATERIAL EXPENSE</b>			<b>215265</b>	<b>89314</b>			
RECOLLECTIBLE/UPRR EXPENSE					304579	0	
ESTIMATED PROJECT COST							304579
EXISTING REUSEABLE MATERIAL CREDIT					0		
SALVAGE NONUSEABLE MATERIAL CREDIT					0		
<b>RECOLLECTIBLE LESS CREDITS</b>							

THE ABOVE FIGURES ARE ESTIMATES ONLY AND SUBJECT TO FLUCTUATION. IN THE EVENT OF  
AN INCREASE OR DECREASE IN THE COST OR QUANTITY OF MATERIAL OR LABOR REQUIRED,  
UPRR WILL BILL FOR ACTUAL CONSTRUCTION COSTS AT THE CURRENT EFFECTIVE RATE.

# EXHIBIT C-1

To Supplemental Agreement

Cover Sheet for the  
Railroad's Signal Material Estimate

DATE: 2009-01-07

ESTIMATE OF MATERIAL AND FORCE ACCOUNT WORK  
BY THE  
UNION PACIFIC RAILROAD

THIS ESTIMATE GOOD FOR 6 MONTHS EXPIRATION DATE IS :2009-07-08

DESCRIPTION OF WORK:

INSTALL AUTOMATIC FLASHING LIGHT CROSSING SIGNALS WITH GATES &  
CANTILEVERS AT GILBERT, AZ. WILLIAMS FIELD ROAD M.P.932.30 ON THE  
PHOENIX SUB DOT#741 831F

WORK TO BE PERFORMED BY RAILROAD WITH EXPENSE AS BELOW:

SIGNAL - TOWN OF GILBERT - 100%

ESTIMATED USING FEDERAL ADDITIVES WITH OVERHEAD & INDIRECT

CONSTRUCTON COST - 167.76%

PID: 60170 AWO: 85362 MP,SUBDIV: 932.30, PHOENIX  
SERVICE UNIT: 16 CITY: HIGLEY STATE: AZ

DESCRIPTION	QTY	UNIT	LABOR	MATERIAL	RECOLL	UPRR	TOTAL
-----							
ENGINEERING WORK							
BILL PREP			900		900		900
CANTILEVER REM/DISP				5000	5000		5000
CONTRACT				9148	9148		9148
ENGINEERING			6210		6210		6210
ENVIRONMENTAL				1	1		1
INSTALL METER				12000	12000		12000
LABOR ADDITIVE 167.76%			263689		263689		263689
NON-STOCK CANTILEVERS				26676	26676		26676
PERMITTING				86250	86250		86250
PRELIMINARY ENGINEERING				20000	20000		20000
ROCK/GRAVEL/FILL				2200	2200		2200
SIG-HWY XNG			151021		151021		151021
TRANSP/IB/OB/RCLW CONTR				14140	14140		14140
-----							
TOTAL ENGINEERING			421820	175415	597235		597235
SIGNAL WORK							
LABOR ADDITIVE 167.76%			1706		1706		1706
MATL STORE EXPENSE				4	4		4
SALES TAX				3659	3659		3659
SIGNAL			1017	91483	92500		92500
-----							
TOTAL SIGNAL			2723	95146	97869		97869
-----							
LABOR/MATERIAL EXPENSE			424543	270561	-----		
RECOLLECTIBLE/UPRR EXPENSE					695104	0	-----
ESTIMATED PROJECT COST							695104

THE ABOVE FIGURES ARE ESTIMATES ONLY AND SUBJECT TO FLUCTUATION. IN THE EVENT OF  
AN INCREASE OR DECREASE IN THE COST OR QUANTITY OF MATERIAL OR LABOR REQUIRED,  
UPRR WILL BILL FOR ACTUAL CONSTRUCTION COSTS AT THE CURRENT EFFECTIVE RATE.



# EXHIBIT D

To To Supplemental Agreement

Cover Sheet for the  
Contractor's Right of Entry Agreement



February 2, 2009

UPRR Folder No.: 2538-71

**To the Contractor:**

Before Union Pacific Railroad Company can permit you to perform work on its property for the reconstruction, widening and improvement of the existing Williams Field Road at-grade public road crossing, it will be necessary for you to complete and execute two originals of the enclosed Contractor's Right of Entry Agreement. Please:

1. Fill in the complete legal name of the contractor in the space provided on Page 1 of the Contractor's Right of Entry Agreement. If a corporation, give the state of incorporation. If a partnership, give the names of all partners.
2. Fill in the date construction will begin and be completed in Article 5, Paragraph A.
3. Fill in the name of the contractor in the space provided in the signature block at the end of the Contractor's Right of Entry Agreement. If the contractor is a corporation, the person signing on its behalf must be an elected corporate officer.
4. Execute and return all copies of the Contractor's Right of Entry Agreement together with your Certificate of Insurance as required in Exhibit B, in the attached, self-addressed envelope.
5. Include a check made payable to the Union Pacific Railroad Company in the amount of **\$500.00**. If you require formal billing, you may consider this letter as a formal bill. In compliance with the Internal Revenue Services' new policy regarding their Form 1099, I certify that 94-6001323 is the Railroad Company's correct Federal Taxpayer Identification Number and that Union Pacific Railroad Company is doing business as a corporation.

Under Exhibit B of the enclosed Contractor's Right of Entry Agreement, you are required to procure Railroad Protective Liability Insurance (RPLI) for the duration of this project. As a service to you, Union Pacific is making this coverage available to you. If you decide that acquiring this coverage from the Railroad is of benefit to you, please contact Mr. Mike McGrade of Marsh USA @ 800-729-7001, e-mail: [william.j.smith@marsh.com](mailto:william.j.smith@marsh.com).

This agreement will not be accepted by the Railroad Company until you have returned all of the following to the undersigned at Union Pacific Railroad Company:

1. Executed, unaltered duplicate original counterparts of the Contractor's Right of Entry Agreement;
2. Your check in the amount of \$500.00 to pay the required balance due of the required Contractor's Right of Entry fee. (The Folder Number and the name "Paul G. Farrell" should be written on the check to insure proper credit). If you require formal billing, you may consider this letter as a formal bill;
3. Copies of all of your up-to-date General Liability, Auto Liability & Workman's Compensation Insurance Certificates (*yours and all contractors*'), naming Union Pacific Railroad Company as additional insured;

Real Estate Department  
UNION PACIFIC RAILROAD COMPANY  
1400 Douglas Street, MS 1690  
Omaha, Nebraska 68179-1690  
fax: 402.501.0340



4. Copy of your up-to-date Railroad Protective Liability Insurance Certificate (*yours and all contractors*'), naming Union Pacific Railroad Company as additional insured.

**RETURN ALL OF THESE REQUIRED ITEMS TOGETHER IN ONE ENVELOPE.  
DO NOT MAIL ANY ITEM SEPARATELY.**

If you have any questions concerning this agreement, please contact me as noted below. Have a safe day!

*Paul G. Farrell*

Senior Manager Contracts

Phone: (402) 544-8620

e-mail: [pgfarrell@up.com](mailto:pgfarrell@up.com)

Real Estate Department  
UNION PACIFIC RAILROAD COMPANY  
1400 Douglas Street, MS 1690  
Omaha, Nebraska 68179-1690  
fax: 402.501.0340





UPRR Folder No.: 2538-71

UPRR Audit No.: S180909

## CONTRACTOR'S RIGHT OF ENTRY AGREEMENT

THIS AGREEMENT is made and entered into as of the \_\_\_\_\_ day of \_\_\_\_\_, 200\_\_\_\_, by and between **UNION PACIFIC RAILROAD COMPANY**, a Delaware corporation ("Railroad"); and

\_\_\_\_\_  
(NAME OF CONTRACTOR)  
a \_\_\_\_\_ corporation ("Contractor").  
(State of Corporation)

### RECITALS:

Contractor has been hired by the *Town of Gilbert* to perform work relating to the improvement, reconstruction and widening of the existing Williams Field Road at-grade public road crossing (the "work"), with all or a portion of such work to be performed on property of Railroad in the vicinity of the Railroad's Mile Post 932.30 on the Railroad's Phoenix Subdivision near Higley (Gilbert), Maricopa County, Arizona, as such location is in the general location shown on the Railroad Location Print marked **Exhibit A**, and as specified on the Detailed Print marked **Exhibit A-1**, each attached hereto and hereby made a part hereof, which work is the subject of a contract dated

\_\_\_\_\_ between the Railroad and the Town of Gilbert.  
(Date of Contract)

The Railroad is willing to permit the Contractor to perform the work described above at the location described above subject to the terms and conditions contained in this Agreement

### AGREEMENT:

**NOW, THEREFORE**, it is mutually agreed by and between Railroad and Contractor, as follows:

#### ARTICLE 1 - DEFINITION OF CONTRACTOR.

For purposes of this Agreement, all references in this agreement to Contractor shall include Contractor's contractors, subcontractors, officers, agents and employees, and others acting under its or their authority.

#### ARTICLE 2 - RIGHT GRANTED; PURPOSE.

Railroad hereby grants to Contractor the right, during the term hereinafter stated and upon and subject to each and all of the terms, provisions and conditions herein contained, to enter upon and have ingress to and egress from the property described in the Recitals for the purpose of performing



the work described in the Recitals above. The right herein granted to Contractor is limited to those portions of Railroad's property specifically described herein, or as designated by the Railroad Representative named in Article 4.

**ARTICLE 3 - TERMS AND CONDITIONS CONTAINED IN EXHIBITS B, C & D.**

The terms and conditions contained in **Exhibit B**, **Exhibit C** and **Exhibit D**, attached hereto, are hereby made a part of this Agreement.

**ARTICLE 4 - ALL EXPENSES TO BE BORNE BY CONTRACTOR; RAILROAD REPRESENTATIVE.**

- A. Contractor shall bear any and all costs and expenses associated with any work performed by Contractor, or any costs or expenses incurred by Railroad relating to this Agreement.
- B. Contractor shall coordinate all of its work with the following Railroad representative or his or her duly authorized representative (the "Railroad Representative"):

*Mike Battista*  
*Manager Track Maintenance*  
*Union Pacific Railroad Company*  
*1255 South Campbell Avenue*  
*Tucson, AZ 85713*  
*Phone: 602-322-2506*  
*Fax: 602-322-2515*

*John Clark*  
*Manager Signal Maintenance*  
*Union Pacific Railroad Company*  
*301 Gila Street*  
*Yuma, AZ 85364*  
*Phone: 925-343-4563*  
*Fax: 928-343-4558*

- C. Contractor, at its own expense, shall adequately police and supervise all work to be performed by Contractor and shall ensure that such work is performed in a safe manner as set forth in Section 7 of **Exhibit B**. The responsibility of Contractor for safe conduct and adequate policing and supervision of Contractor's work shall not be lessened or otherwise affected by Railroad's approval of plans and specifications involving the work, or by Railroad's collaboration in performance of any work, or by the presence at the work site of a Railroad Representative, or by compliance by Contractor with any requests or recommendations made by Railroad Representative.

**ARTICLE 5 - TERM; TERMINATION.**

- A. The grant of right herein made to Contractor shall commence on the date of this Agreement, and continue until \_\_\_\_\_, unless sooner terminated as herein provided, or  
*(Expiration Date)*  
at such time as Contractor has completed its work on Railroad's property, whichever is earlier. Contractor agrees to notify the Railroad Representative in writing when it has completed its work on Railroad's property.
- B. This Agreement may be terminated by either party on ten (10) days written notice to the other party.



**ARTICLE 6 - CERTIFICATE OF INSURANCE.**

- A. Before commencing any work, Contractor will provide Railroad with the (i) insurance binders, policies, certificates and endorsements set forth in **Exhibit C** of this Agreement, and (ii) the insurance endorsements obtained by each subcontractor as required under Section 12 of **Exhibit B** of this Agreement.
- B. All insurance correspondence, binders, policies, certificates and endorsements shall be sent to:

*Union Pacific Railroad Company  
Real Estate Department  
1400 Douglas Street, MS 1690  
Omaha, NE 68179-1690  
UPRR Folder No.: 2538-71*

**ARTICLE 7 - DISMISSAL OF CONTRACTOR'S EMPLOYEE.**

At the request of Railroad, Contractor shall remove from Railroad's property any employee of Contractor who fails to conform to the instructions of the Railroad Representative in connection with the work on Railroad's property, and any right of Contractor shall be suspended until such removal has occurred. Contractor shall indemnify Railroad against any claims arising from the removal of any such employee from Railroad's property.

**ARTICLE 8 - ADMINISTRATIVE FEE.**

Upon the execution and delivery of this Agreement, Contractor shall pay to Railroad **FIVE HUNDRED DOLLARS (\$500.00)** as reimbursement for clerical, administrative and handling expenses in connection with the processing of this Agreement.

**ARTICLE 9 - CROSSINGS.**

No additional vehicular crossings (including temporary haul roads) or pedestrian crossings over Railroad's trackage shall be installed or used by Contractor without the prior written permission of Railroad.

**ARTICLE 10 - EXPLOSIVES.**

Explosives or other highly flammable substances shall not be stored on Railroad's property without the prior written approval of Railroad.



IN WITNESS WHEREOF, the parties hereto have duly executed this agreement in duplicate as of the date first herein written.

**UNION PACIFIC RAILROAD COMPANY**

*(Federal Tax ID #94-6001323)*

By: \_\_\_\_\_

PAUL G. FARRELL  
Senior Manager Contracts

\_\_\_\_\_  
*(Name of Contractor)*

By \_\_\_\_\_

Title: \_\_\_\_\_



1. Re-lay 400-feet of track; Install 160-feet of concrete road crossing panels; Install 110 cross ties; Install 3 carloads of ballast; and other track & surface facilities and materials.
2. Install automatic flashing light crossing signals with gates and cantilevers; and other signal facilities and materials.
3. Engineering Design Review & Flagging.

UNION PACIFIC RAILROAD COMPANY

MILE POST 932.30

GILBERT, MARICOPA CO., AZ.

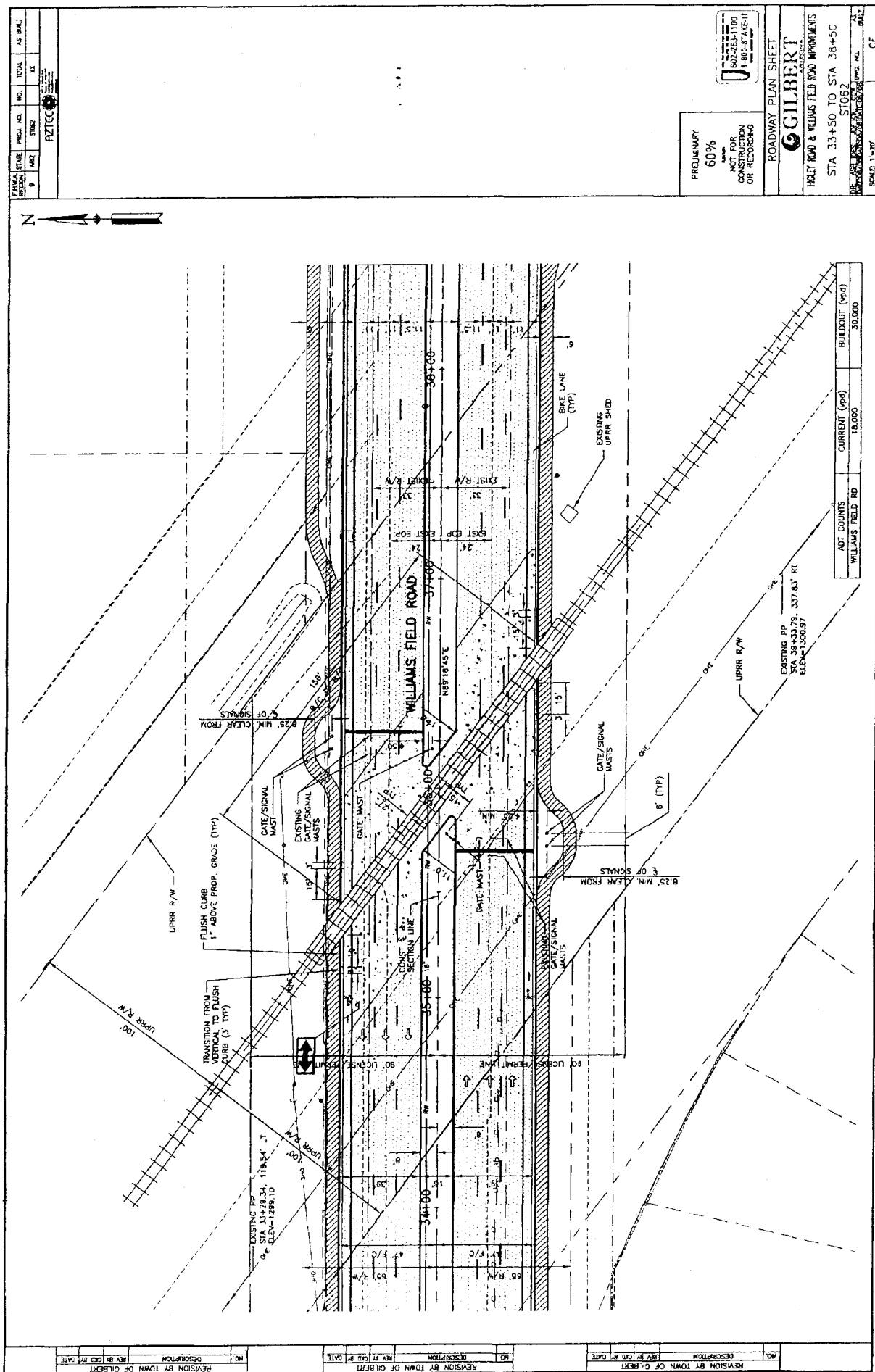
To accompany Contractor's Right of Entry Agreement with

(Name of Contractor)

for an existing at-grade public road crossing reconstruction, widening and improvement project.

Date: February 2, 2009

IN ALL OCCASIONS, U.P. COMMUNICATIONS DEPARTMENT MUST BE CONTACTED IN ADVANCE  
OF ANY WORK TO DETERMINE EXISTENCE AND LOCATION OF FIBER OPTIC CABLE  
PHONE: 1-(800) 336-9193





## EXHIBIT B

### TO CONTRACTOR'S RIGHT OF ENTRY AGREEMENT

#### TERMS AND CONDITIONS

##### **Section 1. NOTICE OF COMMENCEMENT OF WORK - FLAGGING.**

- A. Contractor agrees to notify the Railroad Representative at least ten (10) working days in advance of Contractor commencing its work and at least ten (10) working days in advance of proposed performance of any work by Contractor in which any person or equipment will be within twenty-five (25) feet of any track, or will be near enough to any track that any equipment extension (such as, but not limited to, a crane boom) will reach to within twenty-five (25) feet of any track. No work of any kind shall be performed, and no person, equipment, machinery, tool(s), material(s), vehicle(s), or thing(s) shall be located, operated, placed, or stored within twenty-five (25) feet of any of Railroad's track(s) at any time, for any reason, unless and until a Railroad flagman is provided to watch for trains. Upon receipt of such ten (10)-day notice, the Railroad Representative will determine and inform Contractor whether a flagman need be present and whether Contractor needs to implement any special protective or safety measures. If flagging or other special protective or safety measures are performed by Railroad, Railroad will bill Contractor for such expenses incurred by Railroad, unless Railroad and a federal, state or local governmental entity have agreed that Railroad is to bill such expenses to the federal, state or local governmental entity. If Railroad will be sending the bills to Contractor, Contractor shall pay such bills within thirty (30) days of Contractor's receipt of billing. If Railroad performs any flagging, or other special protective or safety measures are performed by Railroad, Contractor agrees that Contractor is not relieved of any of its responsibilities or liabilities set forth in this Agreement.
- B. The rate of pay per hour for each flagman will be the prevailing hourly rate in effect for an eight-hour day for the class of flagmen used during regularly assigned hours and overtime in accordance with Labor Agreements and Schedules in effect at the time the work is performed. In addition to the cost of such labor, a composite charge for vacation, holiday, health and welfare, supplemental sickness, Railroad Retirement and unemployment compensation, supplemental pension, Employees Liability and Property Damage and Administration will be included, computed on actual payroll. The composite charge will be the prevailing composite charge in effect at the time the work is performed. One and one-half times the current hourly rate is paid for overtime, Saturdays and Sundays, and two and one-half times current hourly rate for holidays. Wage rates are subject to change, at any time, by law or by agreement between Railroad and its employees, and may be retroactive as a result of negotiations or a ruling of an authorized governmental agency. Additional charges on labor are also subject to change. If the wage rate or additional charges are changed, Contractor (or the governmental entity, as applicable) shall pay on the basis of the new rates and charges.
- C. Reimbursement to Railroad will be required covering the full eight-hour day during which any flagman is furnished, unless the flagman can be assigned to other Railroad work during a portion of such day, in which event reimbursement will not be required for the portion of the day during which the flagman is engaged in other Railroad work. Reimbursement will also be required for any day not actually worked by the flagman following the flagman's assignment to work on the project for which Railroad is required to pay the flagman and which could not reasonably be avoided by Railroad by assignment of such flagman to other work, even though Contractor may not be working during such time. When it becomes necessary for Railroad to bulletin and assign an employee to a flagging position in compliance with union collective bargaining agreements, Contractor must provide Railroad a minimum of five (5) days notice prior to the cessation of the need for a flagman. If five (5) days notice of cessation is not given, Contractor will still be required to pay flagging charges for the five (5) day notice period required by union agreement to be given to the employee, even though flagging is not required for that period. An additional ten (10) days notice must then be given to Railroad if flagging services are needed again after such five day cessation notice has been given to Railroad.

##### **Section 2. LIMITATION AND SUBORDINATION OF RIGHTS GRANTED**

- A. The foregoing grant of right is subject and subordinate to the prior and continuing right and obligation of the Railroad to use and maintain its entire property including the right and power of Railroad to construct, maintain, repair, renew, use, operate, change, modify or relocate railroad tracks, roadways, signal, communication, fiber optics, or other wirelines, pipelines and other facilities upon, along or across any or all parts of its property, all or any of which may be freely done at any time or times by Railroad without liability to Contractor or to any other party for compensation or damages.
- B. The foregoing grant is also subject to all outstanding superior rights (including those in favor of licensees and lessees of Railroad's property, and others) and the right of Railroad to renew and extend the same, and is made without covenant of title or for quiet enjoyment.

##### **Section 3. NO INTERFERENCE WITH OPERATIONS OF RAILROAD AND ITS TENANTS.**

- A. Contractor shall conduct its operations so as not to interfere with the continuous and uninterrupted use and operation of the railroad tracks and property of Railroad, including without limitation, the operations of Railroad's lessees, licensees or others, unless specifically authorized in advance by the Railroad Representative. Nothing shall be done or permitted to be done by Contractor at any time that would in any manner impair the safety of such operations. When not in use, Contractor's machinery

and materials shall be kept at least fifty (50) feet from the centerline of Railroad's nearest track, and there shall be no vehicular crossings of Railroad's tracks except at existing open public crossings.

- B. Operations of Railroad and work performed by Railroad personnel and delays in the work to be performed by Contractor caused by such railroad operations and work are expected by Contractor, and Contractor agrees that Railroad shall have no liability to Contractor, or any other person or entity for any such delays. The Contractor shall coordinate its activities with those of Railroad and third parties so as to avoid interference with railroad operations. The safe operation of Railroad train movements and other activities by Railroad takes precedence over any work to be performed by Contractor.

#### Section 4. LIENS.

Contractor shall pay in full all persons who perform labor or provide materials for the work to be performed by Contractor. Contractor shall not create, permit or suffer any mechanic's or materialmen's liens of any kind or nature to be created or enforced against any property of Railroad for any such work performed. Contractor shall indemnify and hold harmless Railroad from and against any and all liens, claims, demands, costs or expenses of whatsoever nature in any way connected with or growing out of such work done, labor performed, or materials furnished. If Contractor fails to promptly cause any lien to be released of record, Railroad may, at its election, discharge the lien or claim of lien at Contractor's expense.

#### Section 5. PROTECTION OF FIBER OPTIC CABLE SYSTEMS.

- A. Fiber optic cable systems may be buried on Railroad's property. Protection of the fiber optic cable systems is of extreme importance since any break could disrupt service to users resulting in business interruption and loss of revenue and profits. Contractor shall telephone Railroad during normal business hours (7:00 a.m. to 9:00 p.m. Central Time, Monday through Friday, except holidays) at 1-800-336-9193 (also a 24-hour, 7-day number for emergency calls) to determine if fiber optic cable is buried anywhere on Railroad's property to be used by Contractor. If it is, Contractor will telephone the telecommunications company(ies) involved, make arrangements for a cable locator and, if applicable, for relocation or other protection of the fiber optic cable. Contractor shall not commence any work until all such protection or relocation (if applicable) has been accomplished.
- B. In addition to other indemnity provisions in this Agreement, Contractor shall indemnify, defend and hold Railroad harmless from and against all costs, liability and expense whatsoever (including, without limitation, attorneys' fees, court costs and expenses) arising out of any act or omission of Contractor, its agents and/or employees, that causes or contributes to (1) any damage to or destruction of any telecommunications system on Railroad's property, and/or (2) any injury to or death of any person employed by or on behalf of any telecommunications company, and/or its contractor, agents and/or employees, on Railroad's property. Contractor shall not have or seek recourse against Railroad for any claim or cause of action for alleged loss of profits or revenue or loss of service or other consequential damage to a telecommunication company using Railroad's property or a customer or user of services of the fiber optic cable on Railroad's property.

#### Section 6. PERMITS - COMPLIANCE WITH LAWS.

In the prosecution of the work covered by this Agreement, Contractor shall secure any and all necessary permits and shall comply with all applicable federal, state and local laws, regulations and enactments affecting the work including, without limitation, all applicable Federal Railroad Administration regulations.

#### Section 7. SAFETY.

- A. Safety of personnel, property, rail operations and the public is of paramount importance in the prosecution of the work performed by Contractor. Contractor shall be responsible for initiating, maintaining and supervising all safety, operations and programs in connection with the work. Contractor shall at a minimum comply with Railroad's safety standards listed in **Exhibit C**, hereto attached, to ensure uniformity with the safety standards followed by Railroad's own forces. As a part of Contractor's safety responsibilities, Contractor shall notify Railroad if Contractor determines that any of Railroad's safety standards are contrary to good safety practices. Contractor shall furnish copies of **Exhibit C** to each of its employees before they enter the job site.
- B. Without limitation of the provisions of paragraph A above, Contractor shall keep the job site free from safety and health hazards and ensure that its employees are competent and adequately trained in all safety and health aspects of the job.
- C. Contractor shall have proper first aid supplies available on the job site so that prompt first aid services may be provided to any person injured on the job site. Contractor shall promptly notify Railroad of any U.S. Occupational Safety and Health Administration reportable injuries. Contractor shall have a nondelegable duty to control its employees while they are on the job site or any other property of Railroad, and to be certain they do not use, be under the influence of, or have in their possession any alcoholic beverage, drug or other substance that may inhibit the safe performance of any work.
- D. If and when requested by Railroad, Contractor shall deliver to Railroad a copy of Contractor's safety plan for conducting the work (the "Safety Plan"). Railroad shall have the right, but not the obligation, to require Contractor to correct any deficiencies in the Safety Plan. The terms of this Agreement shall control if there are any inconsistencies between this Agreement and the Safety Plan.



**Section 8. INDEMNITY.**

- A. To the extent not prohibited by applicable statute, Contractor shall indemnify, defend and hold harmless Railroad, its affiliates, and its and their officers, agents and employees ("Indemnified Parties") from and against any and all loss, damage, injury, liability, claim, demand, cost or expense (including, without limitation, attorney's, consultant's and expert's fees, and court costs), fine or penalty (collectively, "loss") incurred by any person (including, without limitation, any indemnified party, contractor, or any employee of contractor or of any indemnified party) arising out of or in any manner connected with (i) any work performed by Contractor, or (ii) any act or omission of Contractor, its officers, agents or employees, or (iii) any breach of this Agreement by Contractor.
- B. The right to indemnity under this Section 8 shall accrue upon occurrence of the event giving rise to the loss, and shall apply regardless of any negligence or strict liability of any indemnified party, except where the loss is caused by the sole active negligence of an indemnified party as established by the final judgment of a court of competent jurisdiction. The sole active negligence of any indemnified party shall not bar the recovery of any other indemnified party.
- C. Contractor expressly and specifically assumes potential liability under this Section 8 for claims or actions brought by Contractor's own employees. Contractor waives any immunity it may have under worker's compensation or industrial insurance acts to indemnify Railroad under this Section 8. Contractor acknowledges that this waiver was mutually negotiated by the parties hereto.
- D. No court or jury findings in any employee's suit pursuant to any worker's compensation act or the federal employers' liability act against a party to this Agreement may be relied upon or used by Contractor in any attempt to assert liability against Railroad.
- E. The provisions of this Section 8 shall survive the completion of any work performed by Contractor or the termination or expiration of this Agreement. In no event shall this Section 8 or any other provision of this Agreement be deemed to limit any liability Contractor may have to any indemnified party by statute or under common law.

**Section 9. RESTORATION OF PROPERTY.**

In the event Railroad authorizes Contractor to take down any fence of Railroad or in any manner move or disturb any of the other property of Railroad in connection with the work to be performed by Contractor, then in that event Contractor shall, as soon as possible and at Contractor's sole expense, restore such fence and other property to the same condition as the same were in before such fence was taken down or such other property was moved or disturbed. Contractor shall remove all of Contractor's tools, equipment, rubbish and other materials from Railroad's property promptly upon completion of the work, restoring Railroad's property to the same state and condition as when Contractor entered thereon.

**Section 10. WAIVER OF DEFAULT.**

Waiver by Railroad of any breach or default of any condition, covenant or agreement herein contained to be kept, observed and performed by Contractor shall in no way impair the right of Railroad to avail itself of any remedy for any subsequent breach or default.

**Section 11. MODIFICATION - ENTIRE AGREEMENT.**

No modification of this Agreement shall be effective unless made in writing and signed by Contractor and Railroad. This Agreement and the exhibits attached hereto and made a part hereof constitute the entire understanding between Contractor and Railroad and cancel and supersede any prior negotiations, understandings or agreements, whether written or oral, with respect to the work to be performed by Contractor.

**Section 12. ASSIGNMENT - SUBCONTRACTING.**

Contractor shall not assign or subcontract this Agreement, or any interest therein, without the written consent of the Railroad. Contractor shall be responsible for the acts and omissions of all subcontractors. Before Contractor commences any work, the Contractor shall, except to the extent prohibited by law; (1) require each of its subcontractors to include the Contractor as "Additional Insured" in the subcontractor's Commercial General Liability policy and Business Automobile policies with respect to all liabilities arising out of the subcontractor's performance of work on behalf of the Contractor by endorsing these policies with ISO Additional Insured Endorsements CG 20 26, and CA 20 48 (or substitute forms providing equivalent coverage; (2) require each of its subcontractors to endorse their Commercial General Liability Policy with "Contractual Liability Railroads" ISO Form CG 24 17 10 01 (or a substitute form providing equivalent coverage) for the job site; and (3) require each of its subcontractors to endorse their Business Automobile Policy with "Coverage For Certain Operations In Connection With Railroads" ISO Form CA 20 70 10 01 (or a substitute form providing equivalent coverage) for the job site.



## EXHIBIT C

### TO CONTRACTOR'S RIGHT OF ENTRY AGREEMENT

#### INSURANCE PROVISIONS

Contractor shall, at its sole cost and expense, procure and maintain during the course of the Project and until all Project work on Railroad's property has been completed and the Contractor has removed all equipment and materials from Railroad's property and has cleaned and restored Railroad's property to Railroad's satisfaction, the following insurance coverage:

- A. **Commercial General Liability Insurance.** Commercial general liability (CGL) with a limit of not less than \$5,000,000 each occurrence and an aggregate limit of not less than \$10,000,000. CGL insurance must be written on ISO occurrence form CG 00 01 12 04 (or a substitute form providing equivalent coverage).

The policy must also contain the following endorsement, which must be stated on the certificate of insurance:

- Contractual Liability Railroads ISO form CG 24 17 10 01 (or a substitute form providing equivalent coverage) showing "Union Pacific Railroad Company Property" as the Designated Job Site, and
- Designated Construction Project(s) General Aggregate Limit ISO Form CG 25 03 03 97 (or a substitute form providing equivalent coverage) showing the project on the form schedule.

- B. **Business Automobile Coverage Insurance.** Business auto coverage written on ISO form CA 00 01 10 01 (or a substitute form providing equivalent liability coverage) with a combined single limit of not less \$5,000,000 for each accident and coverage must include liability arising out of any auto (including owned, hired and non-owned autos).

The policy must contain the following endorsements, which must be stated on the certificate of insurance:

- Coverage For Certain Operations In Connection With Railroads ISO form CA 20 70 10 01 (or a substitute form providing equivalent coverage) showing "Union Pacific Property" as the Designated Job Site.
- Motor Carrier Act Endorsement - Hazardous materials clean up (MCS-90) if required by law.

- C. **Workers' Compensation and Employers' Liability Insurance.** Coverage must include but not be limited to:

- Contractor's statutory liability under the workers' compensation laws of the state where the work is being performed.
- Employers' Liability (Part B) with limits of at least \$500,000 each accident, \$500,000 disease policy limit \$500,000 each employee.

If Contractor is self-insured, evidence of state approval and excess workers compensation coverage must be provided. Coverage must include liability arising out of the U. S. Longshoremen's and Harbor Workers' Act, the Jones Act, and the Outer Continental Shelf Land Act, if applicable.

The policy must contain the following endorsement, which must be stated on the certificate of insurance:

- Alternate Employer endorsement ISO form WC 00 03 01 A (or a substitute form providing equivalent coverage) showing Railroad in the schedule as the alternate employer (or a substitute form providing equivalent coverage).

- D. **Railroad Protective Liability Insurance.** Contractor must maintain Railroad Protective Liability insurance written on ISO occurrence form CG 00 35 12 04 (or a substitute form providing equivalent coverage) on behalf of Railroad as named insured, with a limit of not less than \$2,000,000 per occurrence and an aggregate of \$6,000,000. A binder stating the policy is in place must be submitted to Railroad before the work may be commenced and until the original policy is forwarded to Railroad.

- E. **Umbrella or Excess Insurance.** If Contractor utilizes umbrella or excess policies, these policies must "follow form" and afford no less coverage than the primary policy.

- F. **Pollution Liability Insurance.** Pollution liability coverage must be written on ISO form Pollution Liability Coverage Form Designated Sites CG 00 39 12 04 (or a substitute form providing equivalent liability coverage), with limits of at least \$5,000,000 per occurrence and an aggregate limit of \$10,000,000.

If the scope of work as defined in this Agreement includes the disposal of any hazardous or non-hazardous materials from the job site, Contractor must furnish to Railroad evidence of pollution legal liability insurance maintained by the disposal site operator for losses arising from the insured facility accepting the materials, with coverage in minimum amounts of \$1,000,000 per loss, and an annual aggregate of \$2,000,000.

#### Other Requirements



- G. All policy(ies) required above (except worker's compensation and employers liability) must include Railroad as "Additional Insured" using ISO Additional Insured Endorsements CG 20 26, and CA 20 48 (or substitute forms providing equivalent coverage). The coverage provided to Railroad as additional insured shall, to the extent provided under ISO Additional Insured Endorsement CG 20 26, and CA 20 48 provide coverage for Railroad's negligence whether sole or partial, active or passive, and shall not be limited by Contractor's liability under the indemnity provisions of this Agreement.
- H. Punitive damages exclusion, if any, must be deleted (and the deletion indicated on the certificate of insurance), unless the law governing this Agreement prohibits all punitive damages that might arise under this Agreement.
- I. Contractor waives all rights of recovery, and its insurers also waive all rights of subrogation of damages against Railroad and its agents, officers, directors and employees. This waiver must be stated on the certificate of insurance.
- J. Prior to commencing the work, Contractor shall furnish Railroad with a certificate(s) of insurance, executed by a duly authorized representative of each insurer, showing compliance with the insurance requirements in this Agreement.
- K. All insurance policies must be written by a reputable insurance company acceptable to Railroad or with a current Best's Insurance Guide Rating of A- and Class VII or better, and authorized to do business in the state where the work is being performed.
- L. The fact that insurance is obtained by Contractor or by Railroad on behalf of Contractor will not be deemed to release or diminish the liability of Contractor, including, without limitation, liability under the indemnity provisions of this Agreement. Damages recoverable by Railroad from Contractor or any third party will not be limited by the amount of the required insurance coverage.



## EXHIBIT D

### TO CONTRACTOR'S RIGHT OF ENTRY AGREEMENT

#### MINIMUM SAFETY REQUIREMENTS

The term "employees" as used herein refer to all employees of Contractor as well as all employees of any subcontractor or agent of Contractor.

#### I. Clothing

- A. All employees of Contractor will be suitably dressed to perform their duties safely and in a manner that will not interfere with their vision, hearing, or free use of their hands or feet.

Specifically, Contractor's employees must wear:

- (i) Waist-length shirts with sleeves.
  - (ii) Trousers that cover the entire leg. If flare-legged trousers are worn, the trouser bottoms must be tied to prevent catching.
  - (iii) Footwear that covers their ankles and has a defined heel. Employees working on bridges are required to wear safety-toed footwear that conforms to the American National Standards Institute (ANSI) and FRA footwear requirements.
- B. Employees shall not wear boots (other than work boots), sandals, canvas-type shoes, or other shoes that have thin soles or heels that are higher than normal.
- C. Employees must not wear loose or ragged clothing, neckties, finger rings, or other loose jewelry while operating or working on machinery.

#### II. Personal Protective Equipment

Contractor shall require its employees to wear personal protective equipment as specified by Railroad rules, regulations, or recommended or requested by the Railroad Representative.

- (i) Hard hat that meets the American National Standard (ANSI) Z89.1 – latest revision. Hard hats should be affixed with Contractor's company logo or name.
- (ii) Eye protection that meets American National Standard (ANSI) for occupational and educational eye and face protection, Z87.1 – latest revision. Additional eye protection must be provided to meet specific job situations such as welding, grinding, etc.
- (iii) Hearing protection, which affords enough attenuation to give protection from noise levels that will be occurring on the job site. Hearing protection, in the form of plugs or muffs, must be worn when employees are within:
  - 100 feet of a locomotive or roadway/work equipment
  - 15 feet of power operated tools
  - 150 feet of jet blowers or pile drivers
  - 150 feet of retarders in use (when within 10 feet, employees must wear dual ear protection – plugs and muffs)
- (iv) Other types of personal protective equipment, such as respirators, fall protection equipment, and face shields, must be worn as recommended or requested by the Railroad Representative.

#### III. On Track Safety

Contractor is responsible for compliance with the Federal Railroad Administration's Roadway Worker Protection regulations – 49CFR214, Subpart C and Railroad's On-Track Safety rules. Under 49CFR214, Subpart C, railroad contractors are responsible for the training of their employees on such regulations. In addition to the instructions contained in Roadway Worker Protection regulations, all employees must:

- (i) Maintain a distance of twenty-five (25) feet to any track unless the Railroad Representative is present to authorize movements.
- (ii) Wear an orange, reflectorized workwear approved by the Railroad Representative.
- (iii) Participate in a job briefing that will specify the type of On-Track Safety for the type of work being performed. Contractor must take special note of limits of track authority, which tracks may or may not be fouled, and clearing the track. Contractor will also receive special instructions relating to the work zone around machines and minimum distances between machines while working or traveling.

#### IV. Equipment

- A. It is the responsibility of Contractor to ensure that all equipment is in a safe condition to operate. If, in the opinion of the Railroad Representative, any of Contractor's equipment is unsafe for use, Contractor shall remove such equipment from Railroad's



property. In addition, Contractor must ensure that the operators of all equipment are properly trained and competent in the safe operation of the equipment. In addition, operators must be:

- Familiar and comply with Railroad's rules on lockout/tagout of equipment.
- Trained in and comply with the applicable operating rules if operating any hy-rail equipment on-track.
  - Trained in and comply with the applicable air brake rules if operating any equipment that moves rail cars or any other railbound equipment.

- B. All self-propelled equipment must be equipped with a first-aid kit, fire extinguisher, and audible back-up warning device.
- C. Unless otherwise authorized by the Railroad Representative, all equipment must be parked a minimum of twenty-five (25) feet from any track. Before leaving any equipment unattended, the operator must stop the engine and properly secure the equipment against movement.
- D. Cranes must be equipped with three orange cones that will be used to mark the working area of the crane and the minimum clearances to overhead powerlines.

**V. General Safety Requirements**

- A. Contractor shall ensure that all waste is properly disposed of in accordance with applicable federal and state regulations.
- B. Contractor shall ensure that all employees participate in and comply with a job briefing conducted by the Railroad Representative, if applicable. During this briefing, the Railroad Representative will specify safe work procedures, (including On-Track Safety) and the potential hazards of the job. If any employee has any questions or concerns about the work, the employee must voice them during the job briefing. Additional job briefings will be conducted during the work as conditions, work procedures, or personnel change.
- C. All track work performed by Contractor meets the minimum safety requirements established by the Federal Railroad Administration's Track Safety Standards 49CFR213.
- D. All employees comply with the following safety procedures when working around any railroad track:
  - (i) Always be on the alert for moving equipment. Employees must always expect movement on any track, at any time, in either direction.
  - (ii) Do not step or walk on the top of the rail, frog, switches, guard rails, or other track components.
  - (iii) In passing around the ends of standing cars, engines, roadway machines or work equipment, leave at least 20 feet between yourself and the end of the equipment. Do not go between pieces of equipment of the opening is less than one car length (50 feet).
  - (iv) Avoid walking or standing on a track unless so authorized by the employee in charge.
  - (v) Before stepping over or crossing tracks, look in both directions first.
  - (vi) Do not sit on, lie under, or cross between cars except as required in the performance of your duties and only when track and equipment have been protected against movement.
- E. All employees must comply with all federal and state regulations concerning workplace safety.

## **Attachment 4**

### **Cooley Station Traffic Impact Study by TASK Engineering**

# Coolley Station Traffic Impact Study

Gilbert, Arizona

Prepared for:

~~Friend Homes~~

August 16, 2006

Revised November 16, 2006

**TASK**  
ENGINEERING

3707 North 7th Street Suite 235

Phoenix, Arizona 85014

Phone: 602-277-4224 Fax: 602-277-4228

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7/21/06 Jm

# **Cooley Station Traffic Impact Study**

## **Gilbert, Arizona**

Prepared for:

Jeff Cooley, Cooley Station  
Gilbert, Arizona



By:

TASK Engineering, Inc  
3707 North 7<sup>th</sup> Street, Suite 235  
Phoenix, AZ 85014

Phone: (602) 277-4224  
Fax: (602) 277-4228

August 16, 2006  
REVISED November 16, 2006



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## INTRODUCTION

This traffic study analyzes the impacts of the proposed mixed residential/commercial development located south of Ray Road, west of Power Road, east of Wade Road, and north of Pecos Road. This particular area is a portion of a larger development, the Cooley Station Master Planned Community. It is located in Gilbert, Arizona as shown on Figure 1. A previous traffic study in this area addressed the entire master planned community at full buildout conditions. This study analyzes the southern portion of the previous Cooley Master Plan.

The purposes of this study are:

1. To determine the access and egress needs to serve the site,
2. To review driveway, access, and deceleration lane configurations on the adjacent roadway network, and
3. To prepare a traffic impact study for submittal to the Town of Gilbert.

Traffic conditions were analyzed for two scenarios: background traffic in Year 2015, plus full development of Cooley Station, and background traffic in the horizon Year 2025, plus full development of the site. Traffic is analyzed at accesses and on all adjacent roadways within one-half mile.

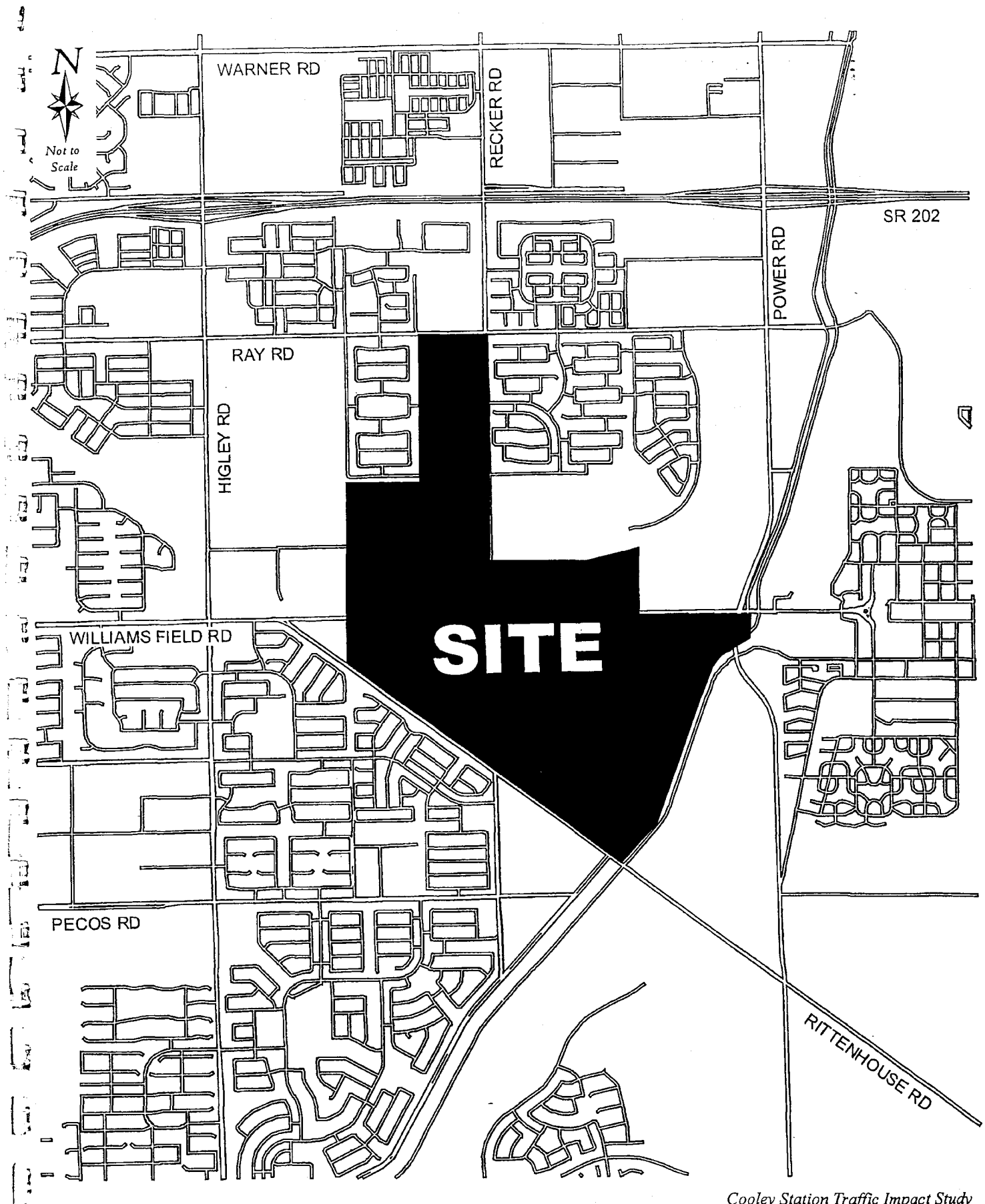
This revised report incorporates comments from the Town of Gilbert dated September 15, 2006. A copy of the comments and a response memorandum are included in Appendix G.

The conclusions of this report are listed in the final section, RECOMMENDATIONS. Appendix A contains summaries of individual capacity analyses. The following sections detail the methodology used to reach the conclusions.

## DESCRIPTION OF PROPOSED DEVELOPMENT

The schematic site plan for the proposed development is shown on Figure 2. It is a mixed residential and commercial development with  $\pm 8,099$  dwelling units, a  $\pm 79.74$  acre Village Center, a  $\pm 40.03$  acre Business Park, a  $\pm 21$  acre K-8 School, and  $\pm 21.2$  acre shopping center parcel. The residential lots are composed of single family, town homes and apartments. The commercial site is assumed to have general retail stores and is regarded as a shopping center.

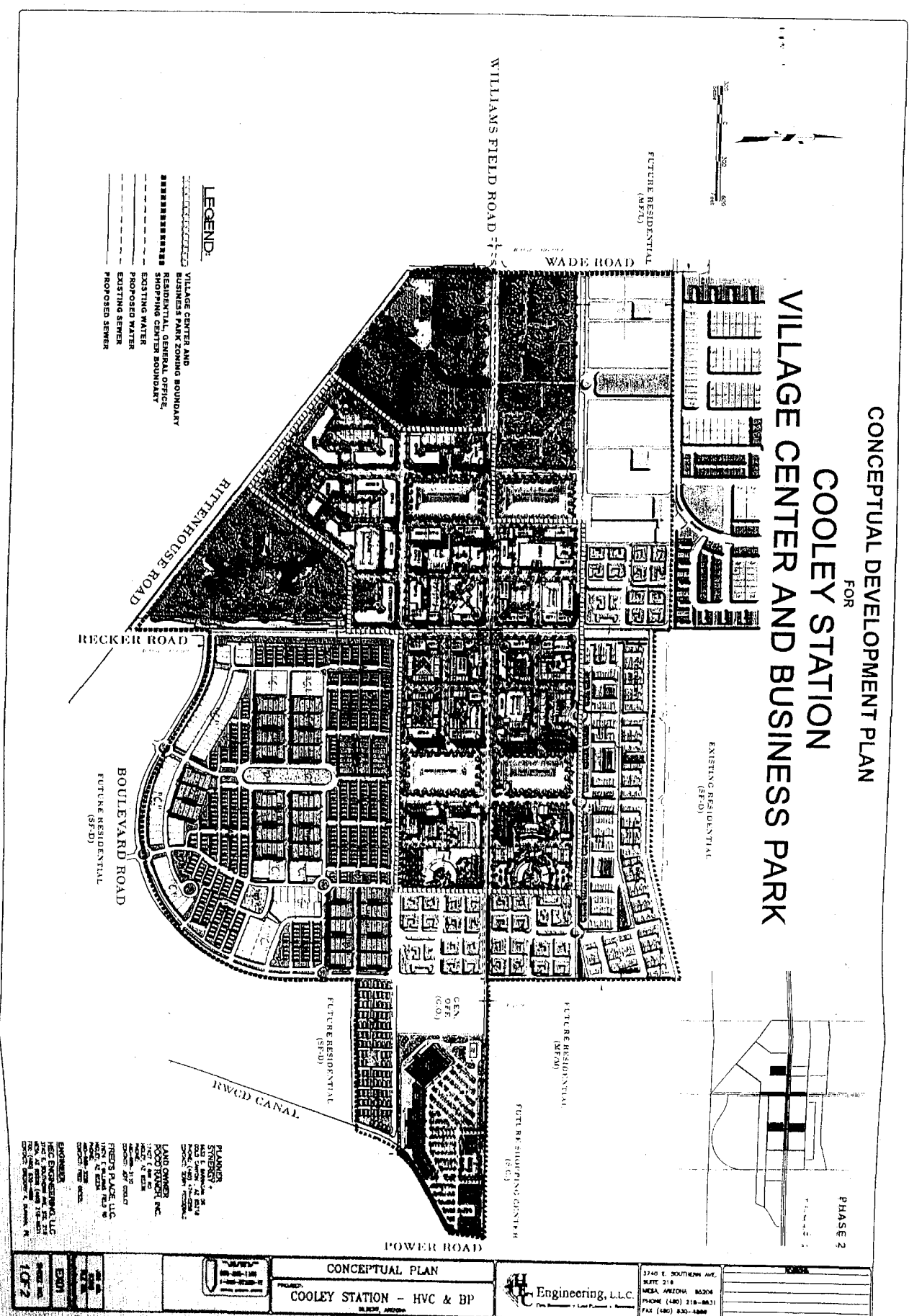
There is an existing high school, Higley High School, located on the northeast corner of Pecos Road and Recker Road. There is also an existing shopping center located on the northwest corner of Williams Field Road and Power Road. Arizona State University Polytechnic Campus is also located near the site, east of Power Road. These adjacent sites create additional traffic on the arterial roadways and will interact with the site. Currently the site area and most of the surrounding area a combination of agricultural and residential land uses, with extensive development occurring in the area.



Cooley Station Traffic Impact Study



Vicinity Map



**LEGEND:**

- VILLAGE CENTER AND BUSINESS PARK ZONING BOUNDARY
- RESIDENTIAL, GENERAL OFFICE, SHOPPING CENTER BOUNDARY
- PROPOSED WATER
- EXISTING WATER
- EXISTING SEWER
- PROPOSED SEWER

**PLANNERS:**  
 ANDERSON & ASSOCIATES, INC.  
 1000 N. 10TH AVE., SUITE 200  
 DENVER, CO 80202  
 (303) 733-1100

**LAND OWNER:**  
 ROCK RIVER, INC.  
 1000 N. 10TH AVE., SUITE 200  
 DENVER, CO 80202  
 (303) 733-1100

**PREPARED BY:**  
 HVC ENGINEERING, LLC  
 3740 E. SOUTHWIND AVENUE, SUITE 210  
 ANCHORAGE, ALASKA 99504  
 (907) 218-8631  
 (907) 218-8632

<b>CONCEPTUAL PLAN</b> <b>COOLEY STATION - HVC &amp; BP</b> ANCHORAGE, ALASKA		<b>HVC Engineering, L.L.C.</b> 3740 E. SOUTHWIND AVENUE, SUITE 210 ANCHORAGE, ALASKA 99504 PHONE (907) 218-8631 FAX (907) 218-8632
<b>ENGINEER:</b> HVC ENGINEERING, LLC 3740 E. SOUTHWIND AVENUE, SUITE 210 ANCHORAGE, ALASKA 99504 (907) 218-8631	<b>EX-01</b> SHEET NO. 105-2	<b>PHASE 2</b> COOLEY STATION

Figure 2  
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## DESCRIPTION OF ROAD NETWORK

The internal road network is shown on Figure 2.

Power Road serves as the main north-south through street, connecting the site area to the San Tan Freeway. Power Road is currently two lanes in each direction in the vicinity of the site. Power Road has signalized intersection control at Ray Road, Williams Field Road, and Pecos Road.

Recker Road is currently under construction south of Warner Road and between Williams Field Road and Pecos Road. Recker Road has signalized intersection control at Pecos Road, Ray Road and Warner Road, and is four-way STOP sign controlled at Williams Field Road. Although it is an arterial, Recker Road does not have an interchange with the San Tan Freeway, and it does not extend through to Germann Road on the south.

Williams Field Road is currently two lanes in each direction in the vicinity of the site, with a posted speed limit of 45 mph.

East of Recker Road, Ray Road is a five-lane road (two lanes westbound and three lanes eastbound). West of Recker Road, Ray Road is a six-lane road. The posted speed limit on Ray Road is 45 mph.

West of Recker Road, Pecos Road is a five-lane roadway (two lanes eastbound and three lanes westbound). East of Recker Road, Pecos Road is a six-lane roadway. The posted speed limit is 45 mph.

## TRIP GENERATION

The first step in estimating traffic from the proposed development is to calculate the total estimated vehicle trips to and from the site on an average weekday after the site has been completely built out. This is called trip generation. Vehicle trips are estimated for a total average weekday and for AM and PM peak hours. *Trip Generation, Seventh Edition*, 2003, and the *Trip Generation Handbook, 2<sup>nd</sup> Edition*, June 2004, published by the Institute of Transportation Engineers (ITE), were the sources for the trip rates used in this study.

For a large area such as this, some trips will have both their origin and their destination end within the study area. These are referred to as "internal" trips. Other trips will have one end, either origin or destination, in the site and the other end outside the site. These are referred to as "external" trips. The arterial street approaches to the site that these external trips use are referred to as "external stations."

Each trip has two trip ends. The trip Production end represents the end of the trip where the decision to make a trip is made. Generally, this is the home end of a home-based trip. The Attraction end of the trip is generally the end where the trip maker engages in some activity, such as employment, shopping, education or recreation.

Cooley Station				Trip Rates										Total								
TAZ	Parcel #	TC ID	Parcel Type	Units	Acres	Amount	L.U.C.	Daily Rate	AM Rate	PM Rate	% In AM	% In PM	Weekday	AM In	AM Out	PM In	PM Out					
1	1	223	Residential (5-8 DU/Acre)	DUs	79.13	633	210	9.57	0.75	1.01	25%	63%	6,058	119	356	403	237					
2	2	226	Residential (5-8 DU/Acre)	DUs	78.84	630	210	9.57	0.75	1.01	25%	63%	6,029	118	354	401	235					
3	3	230	Residential (8-14 DU/Acre)	DUs	16.02	224	230	5.86	0.44	0.52	17%	67%	1,313	17	82	78	38					
4	4	233	Residential (8-14 DU/Acre)	DUs	13.44	188	230	5.86	0.44	0.52	17%	67%	1,102	14	69	65	32					
5	5	238	Residential (14-25 DU/Acre)	DUs	29.78	744	220	6.72	0.51	0.62	20%	65%	5,000	76	304	300	161					
6	6A	-	Village Center (Residential)	DUs	10.01	171	220	6.72	0.51	0.62	20%	65%	1,149	17	70	69	37					
6	6B	-	Village Center (General Office)	TGSF	2.90	94,837	710	4.49	0.67	0.46	88%	17%	426	56	8	7	36					
6	6C	-	Village Center (Commercial)	TGSF	2.20	71,945	820	76.21	1.79	7.00	61%	48%	5,483	79	50	242	262					
7	7A	241	Sum Village Center Parcel 6	-	-	-	-	-	-	-	-	-	7,058	152	128	318	335					
7	7B	-	Village Center (Residential)	DUs	10.01	171	220	6.72	0.51	0.62	20%	65%	1,149	17	70	69	37					
7	7C	-	Village Center (General Office)	TGSF	2.90	94,837	710	4.49	0.67	0.46	88%	17%	426	56	8	7	36					
7	7C	-	Village Center (Commercial)	TGSF	2.20	71,945	820	76.21	1.79	7.00	61%	48%	5,483	79	50	242	262					
8	8	245	Sum Village Center Parcel 7	-	-	-	-	-	-	-	-	-	7,058	152	128	318	335					
9	9	248	Residential (14-25 DU/Acre)	DUs	23.94	598	220	6.72	0.51	0.62	20%	65%	4,019	61	244	241	130					
10	10	250	Residential (14-25 DU/Acre)	DUs	25.97	649	220	6.72	0.51	0.62	20%	65%	4,361	66	265	262	141					
10	10	251	Residential (8-14 DU/Acre)	DUs	26.21	366	230	5.86	0.44	0.52	17%	67%	2,145	27	134	128	63					
11	11	254	Residential (5-8 DU/Acre)	DUs	99.36	783	210	9.57	0.75	1.01	25%	63%	7,493	147	440	498	293					
12	12	256	K-8 School	Students	21.00	600	520	1.29	0.42	0.28	55%	45%	774	139	113	76	92					
13	13	259	Residential (5-8 DU/Acre)	DUs	79.40	635	210	9.57	0.75	1.01	25%	63%	6,077	119	357	404	237					
14	14	269	Commercial	TGSF	21.20	194	820	53.85	1.20	5.00	61%	48%	10,447	142	91	466	504					
15	15	270	Residential (14-25 DU/Acre)	DUs	9.97	249	220	6.72	0.51	0.62	20%	65%	1,673	25	102	100	54					
16	16A	-	Village Center (Residential)	DUs	29.87	506	220	6.72	0.51	0.62	20%	65%	3,400	52	206	204	110					
16	16B	-	Village Center (General Office)	TGSF	8.66	282,997	710	3.77	0.58	0.46	88%	17%	1,067	144	20	22	108					
16	16C	-	Village Center (Commercial)	TGSF	6.57	214,688	820	51.98	1.15	4.83	61%	48%	11,159	151	96	498	539					
16	16	-	Sum Village Center Parcel 16	-	-	-	-	-	-	-	-	-	15,627	347	322	724	757					
17	17	282	Residential (14-25 DU/Acre)	DUs	9.97	249	220	6.72	0.51	0.62	20%	65%	1,673	25	102	100	54					
18	18A	-	Village Center (Residential)	DUs	29.87	507	220	6.72	0.51	0.62	20%	65%	3,407	52	207	204	110					
18	18B	-	Village Center (General Office)	TGSF	8.66	282,997	710	3.77	0.58	0.46	88%	17%	1,067	144	20	22	108					
18	18C	-	Village Center (Commercial)	TGSF	6.57	214,688	820	51.98	1.15	4.83	61%	48%	11,159	151	96	498	539					
-	-	283	Sum Village Center Parcel 18	-	-	-	-	-	-	-	-	-	15,633	347	323	724	757					
19	19	285	Residential (8-14 DU/Acre)	DUs	25.44	356	230	5.86	0.44	0.52	17%	67%	2,086	27	130	124	61					
20	20	287	Residential (14-25 DU/Acre)	DUs	7.68	192	220	6.72	0.51	0.62	20%	65%	1,290	20	78	77	42					
21	21	290	Residential (14-25 DU/Acre)	DUs	9.93	248	220	6.72	0.51	0.62	20%	65%	1,667	25	101	100	54					
22	22	291	Business Park	TGSF	40.00	635	770	12.76	1.43	1.29	84%	23%	8,103	763	145	188	631					
23	23	293	General Office	TGSF	6.20	68	710	4.73	0.70	0.46	88%	17%	322	42	6	5	26					
Sum of DUs							8,099											117,006	2,969	4,373	6,100	5,270

Cooley Station			Trip Rates										Total				
TAZ	Parcel #	TC ID	Parcel Type	Units	Acres	Amount	L.U.C.	Daily Rate	AM Rate	PM Rate	% In AM	% In PM	Weekday	AM In	AM Out	PM In	PM Out
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7	7A	241	Sum Village Center Parcel 6	DUs	~	~	~	~	~	~	~	~	7,058	152	128	318	335
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8	8	245	Sum Village Center Parcel 7	DUs	~	~	~	~	~	~	~	~	7,058	152	128	318	335
9	9	248	Residential (14-25 DU/Acre)	DUs	23.94	598	220	6.72	0.51	0.62	20%	65%	4,019	61	244	241	130
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16	16C	~	Village Center (Commercial)	TGSF	6.57	214,688	820	51.98	1.15	4.83	61%	48%	11,159	151	96	498	539
17	17	280	Sum Village Center Parcel 16	DUs	~	~	~	~	~	~	~	~	15,627	347	322	724	757
18	18A	282	Residential (14-25 DU/Acre)	DUs	9.97	249	220	6.72	0.51	0.62	20%	65%	1,673	25	102	100	54
18	18B	~	Village Center (Residential)	DUs	29.87	507	220	6.72	0.51	0.62	20%	65%	3,407	52	207	204	110
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20	20	287	Residential (14-25 DU/Acre)	DUs	7.68	192	220	6.72	0.51	0.62	20%	65%	1,290	20	78	77	42
21	21	290	Residential (14-25 DU/Acre)	DUs	9.93	248	220	6.72	0.51	0.62	20%	65%	1,667	25	101	100	54
22	22	291	Business Park	TGSF	40.00	635	770	12.76	1.43	1.29	84%	73%	8,103	763	145	188	631
23	23	293	General Office	TGSF	6.20	68	710	4.73	0.70	0.46	88%	17%	332	42	6	5	26
Sum of DUs													117,006	2,969	4,373	6,100	5,270
8,099																	

Cooley Station Traffic Impact Study  
Table 1  
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Trip Generation



Cooley Station			Trip Productions										Trip Attractions					
TAZ	Parcel #	TC ID	Parcel Type	Units	Acres	Amount	L.U.C.	% Attractions	Weekday	AM In	AM Out	PM In	PM Out	Weekday	AM In	AM Out	PM In	PM Out
1	1	223	Residential (5-8 DU/Acre)	DUs	79.13	633	210	5%	5,755	113	338	383	225	303	6	18	20	12
2	2	226	Residential (5-8 DU/Acre)	DUs	78.84	630	210	5%	5,728	112	337	381	224	301	6	18	20	12
3	3	230	Residential (8-14 DU/Acre)	DUs	16.02	224	230	5%	1,247	16	78	74	37	66	1	4	4	2
4	4	233	Residential (8-14 DU/Acre)	DUs	13.44	188	230	5%	1,047	13	65	62	31	55	1	3	3	2
5	5	238	Residential (14-25 DU/Acre)	DUs	29.78	744	220	5%	4,750	72	288	285	153	250	4	15	15	8
6	6A	~	Village Center (Residential)	DUs	10.01	171	220	5%	1,092	17	66	65	35	57	1	3	3	2
6	6B	~	Village Center (General Office)	TGSF	2.90	94,837	710	60%	170	22	3	3	14	255	34	5	4	22
6	6C	~	Village Center (Commercial)	TGSF	2.20	71,945	820	60%	2,193	31	20	97	105	3,290	47	30	145	157
7	7A	241	Sum Village Center Parcel 6	~	~	~	~	~	3,455	70	89	165	154	3,603	82	38	153	181
7	7B	~	Village Center (Residential)	DUs	10.01	171	220	5%	1,092	17	66	65	35	57	1	3	3	2
7	7C	~	Village Center (General Office)	TGSF	2.90	94,837	710	60%	170	22	3	3	14	255	34	5	4	22
7	7C	~	Village Center (Commercial)	TGSF	2.20	71,945	820	60%	2,193	31	20	97	105	3,290	47	30	145	157
8	8	245	Sum Village Center Parcel 7	~	~	~	~	~	3,455	70	89	165	154	3,603	82	38	153	181
9	9	248	Residential (14-25 DU/Acre)	DUs	25.97	649	220	5%	3,818	58	232	229	123	201	3	12	12	6
10	10	251	Residential (14-25 DU/Acre)	DUs	26.21	366	230	5%	4,143	63	252	248	134	218	3	13	13	7
10	10	251	Residential (8-14 DU/Acre)	DUs	26.21	366	230	5%	2,038	26	127	121	60	107	1	7	6	3
11	11	254	Residential (5-8 DU/Acre)	DUs	99.36	783	210	5%	7,119	139	418	473	278	375	7	22	25	15
12	12	256	K-8 School	Students	21.00	600	520	85%	116	21	17	11	14	658	118	96	64	79
13	13	259	Residential (5-8 DU/Acre)	DUs	79.40	635	210	5%	5,773	113	339	384	225	304	6	18	20	12
14	14	269	Commercial	TGSF	21.20	194	820	50%	5,223	71	45	233	252	5,223	71	45	233	252
15	15	270	Residential (14-25 DU/Acre)	DUs	9.97	249	220	5%	1,590	24	97	95	51	84	1	5	5	3
16	16A	~	Village Center (Residential)	DUs	29.87	506	220	5%	3,230	49	196	194	104	170	3	10	10	5
16	16B	~	Village Center (General Office)	TGSF	8.66	282,997	710	60%	4,277	58	8	9	43	640	87	12	13	65
16	16C	~	Village Center (Commercial)	TGSF	6.57	214,688	820	60%	4,464	60	39	199	216	6,696	90	58	299	324
17	17	280	Sum Village Center Parcel 16	~	~	~	~	~	8,121	167	243	402	363	7,506	180	80	322	394
18	18	282	Residential (14-25 DU/Acre)	DUs	9.97	249	220	5%	1,590	24	97	95	51	84	1	5	5	3
18	18A	~	Village Center (Residential)	DUs	29.87	507	220	5%	3,237	49	197	194	105	170	3	10	10	6
18	18B	~	Village Center (General Office)	TGSF	8.66	282,997	710	50%	533	72	10	11	54	533	72	10	11	54
18	18C	~	Village Center (Commercial)	TGSF	6.57	214,688	820	50%	5,580	75	48	249	270	5,580	75	48	249	270
19	19	283	Sum Village Center Parcel 18	~	~	~	~	~	9,350	197	255	454	428	6,284	150	68	270	329
20	20	285	Residential (8-14 DU/Acre)	DUs	25.44	356	230	5%	1,982	25	124	118	58	104	1	7	6	3
21	21	287	Residential (14-25 DU/Acre)	DUs	7.68	192	220	5%	1,226	19	74	74	40	65	1	4	4	2
21	21	290	Residential (14-25 DU/Acre)	DUs	9.93	248	220	5%	1,583	24	96	95	51	83	1	5	5	3
22	22	291	Business Park	TGSF	40.00	635	770	50%	4,051	381	73	94	315	4,051	381	73	94	315
23	23	293	General Office	TGSF	6.20	68	710	50%	161	21	3	3	13	161	21	3	13	13
Sum of DUs					8,099	83,319	1,840	3	83,319	1,840	3,775	4,644	3,435	33,688	1,128	598	1,456	1,835

**TCAD ID** is the ID unique to the TransCAD modeling program used to identify the endpoint associated with each parcel.

**Parcel Type** describes the parcel use.

**Units** specifies the units of land use used for generating trips. "Thousands of Gross Square Feet" is abbreviated TGSF. Dwelling units is abbreviated DUs.

**Amount** is the number of units in the parcel (i.e. 544 Thousand Gross Square Feet or 134 Dwelling Units).

**LUC** is the ITE Land Use Code. It refers to the section of the ITE manual from which the trip rates were obtained.

**Rates** present the number of daily, AM peak hour and PM peak hour vehicle trips to and from the subject land use per unit.

**Percent In** is the percentage of AM and PM vehicle trips arriving inbound at the land use. The remaining percent of trips are leaving outbound. For instance, 25 percent of AM peak hour trips are arriving at a single family home, and the remaining 75 percent are leaving the home. For daily trips, it is assumed that 50 percent are inbound trips and 50 percent are outbound trips.

**Trips** are the calculated number of trips. They are calculated as the amount times the rate times the percent inbound or outbound.

Productions and Attractions for adjacent developments can be found in Appendix D. Detailed trip generation tables for the adjacent developments are shown in Appendix C. The total internal Productions for the study area are more than the total internal Attractions. The difference is Attractions to external stations. These are trips between the study area and other locations in the metropolitan region.

## TRIP DISTRIBUTION

Trip distribution is the process of assigning a starting location for each inbound trip to the site and an ending location for each outbound trip. Daily, AM peak hour and PM peak hour trips are distributed separately.

External trips are split between a number of external stations, which represent arterial approaches to the study area. Total external trip Attractions are calculated as the difference between internal Productions and internal Attractions. Specifically;

$$\text{Total Daily A(Ext)} = \text{Total Daily P(Int)} - \text{Total Daily A(Int)}$$

$$\text{Total AM-In A(Ext)} = \text{Total AM-Out P(Int)} - \text{Total AM-In A(Int)}$$

$$\text{Total AM-Out A(Ext)} = \text{Total AM-In P(Int)} - \text{Total AM-Out A(Int)}$$

$$\text{Total PM-In A(Ext)} = \text{Total PM-Out P(Int)} - \text{Total PM-In A(Int)}$$

$$\text{Total PM-Out A(Ext)} = \text{Total PM-In P(Int)} - \text{Total PM-Out A(Int)}$$

Where,

Daily = ADT trip generation

A = Attractions

P = Productions

Int = Internal zone

Ext = External station

Site trips were distributed by direction proportionally to the sum of Year 2020 population and employment forecasts within ten miles of the center of the site. These projections were obtained from Year 2020 Population and Employment projections by the Maricopa Association of Government (MAG). These values are shown in Table 3. A worksheet of MAG data for the site is included in Appendix B.

**Table 3**  
**Trip Distribution Percentages**

*Cooley Station Traffic Impact Study*

Direction	Trip Distribution Percentage
Higley Road, North	20%
Recker Road, North	2%
Power Road, North	2%
San Tan Freeway, East	15%
Ray Road, East	3%
Williams Field Road, East	5%
Pecos Road, East	1%
Power Road, South	2%
Higley Road, South	4%
Pecos Road, West	5%
Williams Field Road, West	10%
Ray Road, West	10%
San Tan Freeway, West	21%
Total	100%

The next step is to run the TransCAD program gravity model to create tables of trip origins and destinations. The gravity model is the most widely used trip distribution model. This model explicitly relates flows between zones to inter-zonal impedance to travel.

The assumption behind the gravity model is that the number of trips produced at zone i that are attracted to zone j is proportional to:

- The number of trips produced in zone i
- The number of trips attracted to zone j
- A function of the relative impedance between the zones, called impedance.

For this study the impedance between zones i and j is defined as:

$$F(c_{ij}) = (1/c_{ij}) \times e^{-0.01(c_{ij})},$$

Where,  $c_{ij}$  = travel time between zones i and j, which is distance times 60 divided by miles per hour. For external stations, a distance to the average location for trips going in that direction was added to the calculation of distance. The final step is to convert the trip matrices from the gravity model into trip matrices ready to assign to the network.

There are three trip matrices for assignment:

1. **Average Daily Traffic (ADT)** This is the daily trip table, balanced so that trips from zone i to zone j equal trips from zone j to zone i.
2. **AM Trip Table** The trip table made with AM inbound Productions and outbound Attractions is transposed and added to the trip table made with AM outbound Productions and inbound Attractions.
3. **PM Trip Table** The trip table made with PM inbound Productions and outbound Attractions is transposed and added to the trip table made with PM outbound Productions and inbound Attractions.

## STUDY AREA TRAFFIC ASSIGNMENT

A traffic assignment was performed with the use of TransCAD transportation software. Vehicle trips between each origin and destination were determined as outlined above and combined in an origin-destination (O-D) matrix in TransCAD. A graphical representation of the transportation network servicing the study area was also created in TransCAD. The flows of traffic for each O-D pair in the matrix were loaded onto the transportation network. The number of trips assigned to a roadway is based upon the travel time each path could carry.

A User Equilibrium Capacity Restraint method was used to assign the trips within TransCAD. Capacity Restraint recalculates travel time on roadways based on the volume and level of congestion on them. The program then reassigns trips using the new travel times. This is repeated up to 20 iterations to achieve an equilibrium solution. Background traffic is included for the recalculation of travel time in each iteration.

User equilibrium uses an iterative process to achieve a convergent solution in which no traveler can improve his or her travel time by shifting routes.

In each iteration, network link flows are computed, which incorporate link capacity restraint effects and flow-dependent travel times. The formulation of the User Equilibrium problem as a mathematical program and the Frank-Wolf solution method employed in TransCAD are described in the TransCAD user manual, Technical Notes section in Chapter 9.

This process was first completed for the entire study area with full access on all site roadways and accesses. Figure 3 presents an area key map for the study area. Figure 4 presents the study area average daily traffic for full buildout, and Figure 5 presents AM and PM peak hour turning movements at critical intersections, expected to be traveling to and from the study area.

As mentioned in the TRIP GENERATION section, the study area includes the Cooley Station development, and several adjacent parcels. The adjacent parcels are the adjacent Park, the Dibella commercial and residential property and the adjacent existing high school.

## BACKGROUND TRAFFIC

Background traffic is the amount of traffic that would be on area roads in the future, if the proposed development were not built.

For Year 2025, background values on the roadways were determined by subtracting the study area traffic, as described in the previous section, from the Year 2025 MAG projections for the area.

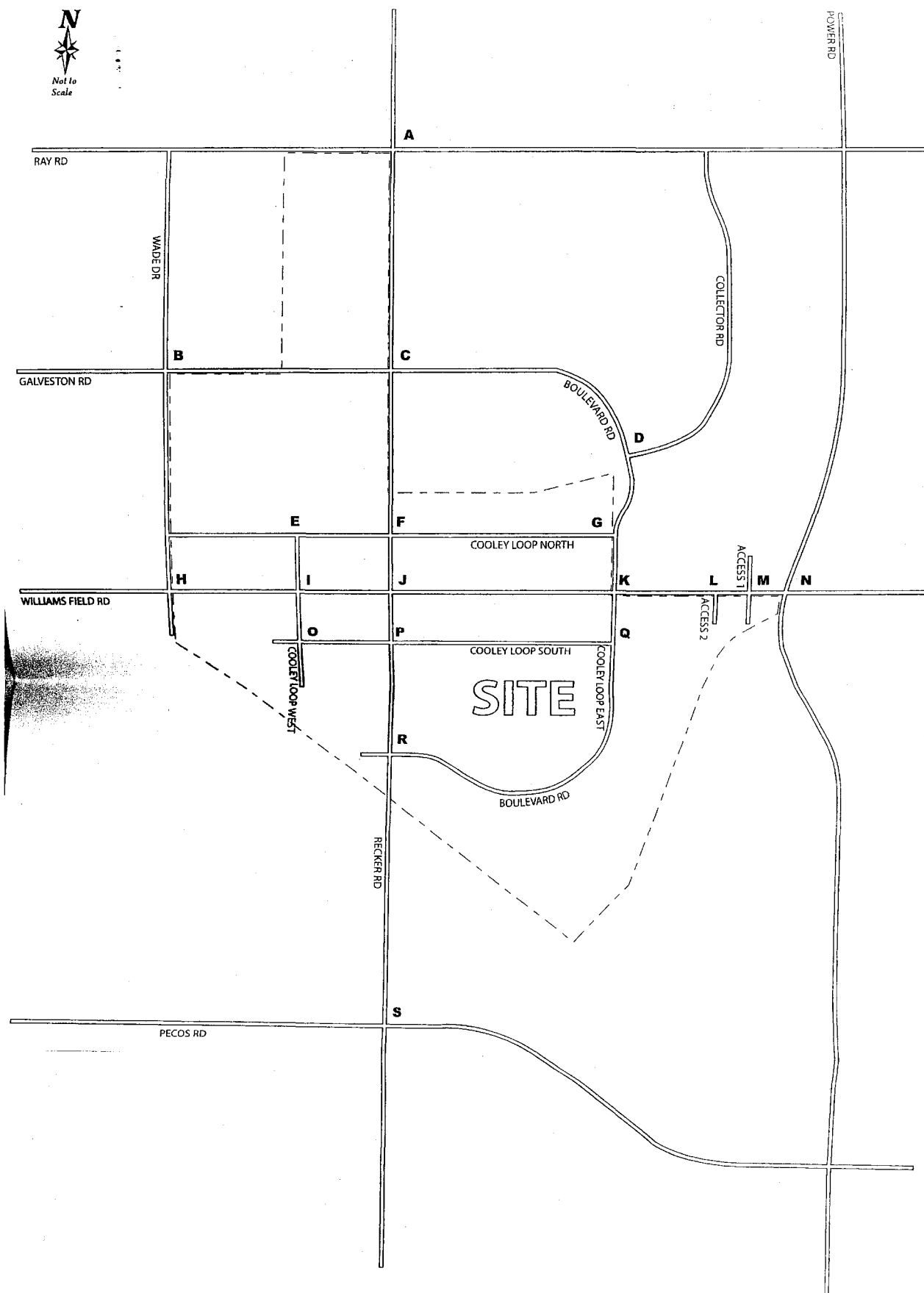
For Year 2015, the background traffic for Year 2025 calculated above was then taken and interpolated between existing counts and Year 2025 to obtain Year 2015 background volumes.

For Year 2025, average daily traffic was converted to hourly volumes using the following formula:

$$DDHV = AADT \times K \times D$$

Where:      AADT = forecast average annual daily traffic (vpd)  
              DDHV = directional design hourly volume (vph)  
              K = percent of AADT occurring in the peak hour, and  
              D = percent of peak-hour traffic in the heaviest direction.

A K value of 0.09 was used for the roadways. A D value of 60 percent was used, going westbound and northbound during the AM peak hour, and eastbound and southbound during the PM peak hour. To estimate total background AM and PM peak hour turns, a nonlinear programming procedure was developed. This inputs the approach and departure volumes determined above and a starting estimate of percent right and left turns for each approach.



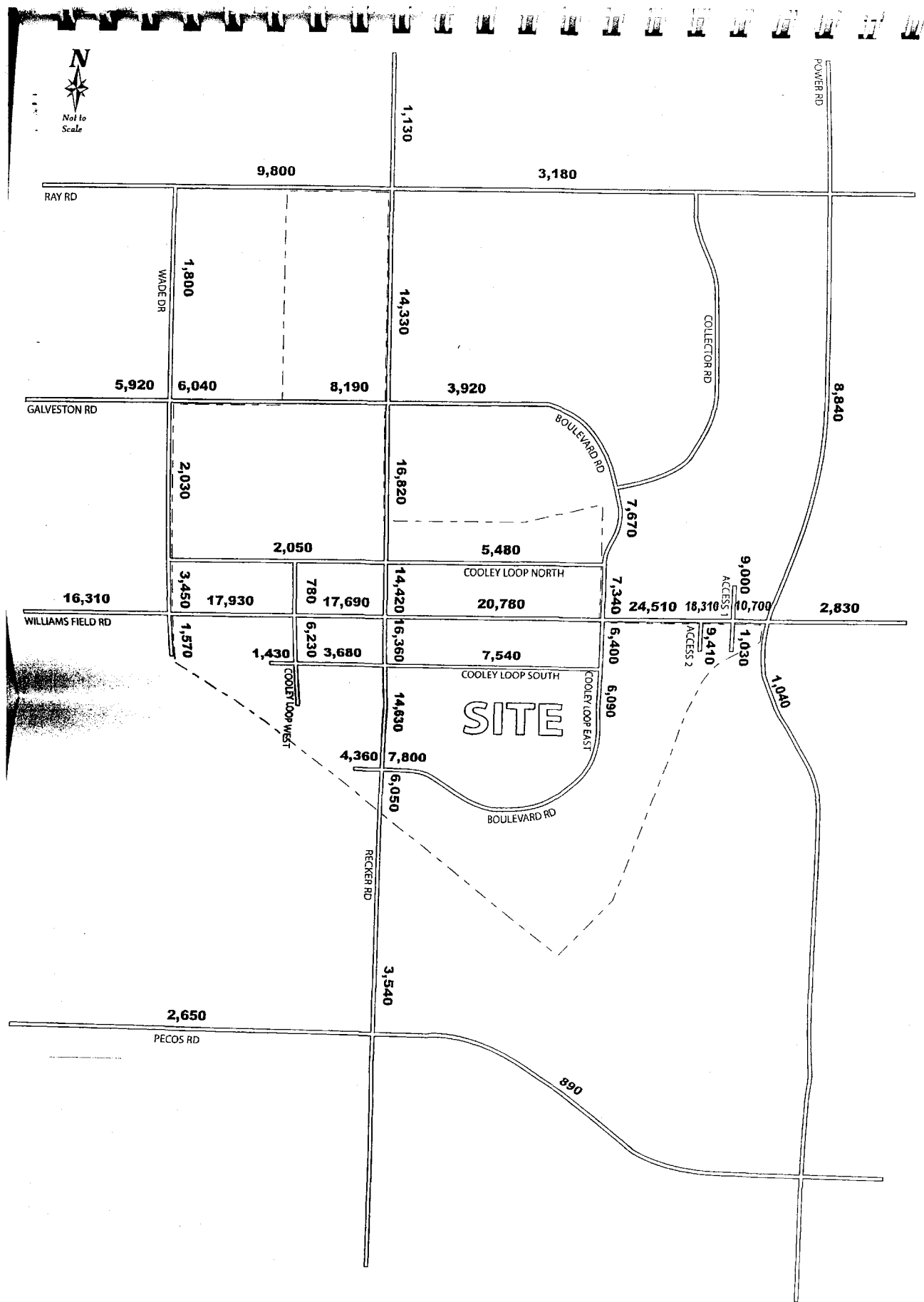
LEGEND:  
X (Y) : AM (PM) Peak Hour Traffic  
Z : Average Daily Traffic (in bold font)

**TASK**  
ENGINEERING

Key Map

[Title] Traffic Impact Study

Figure 3  
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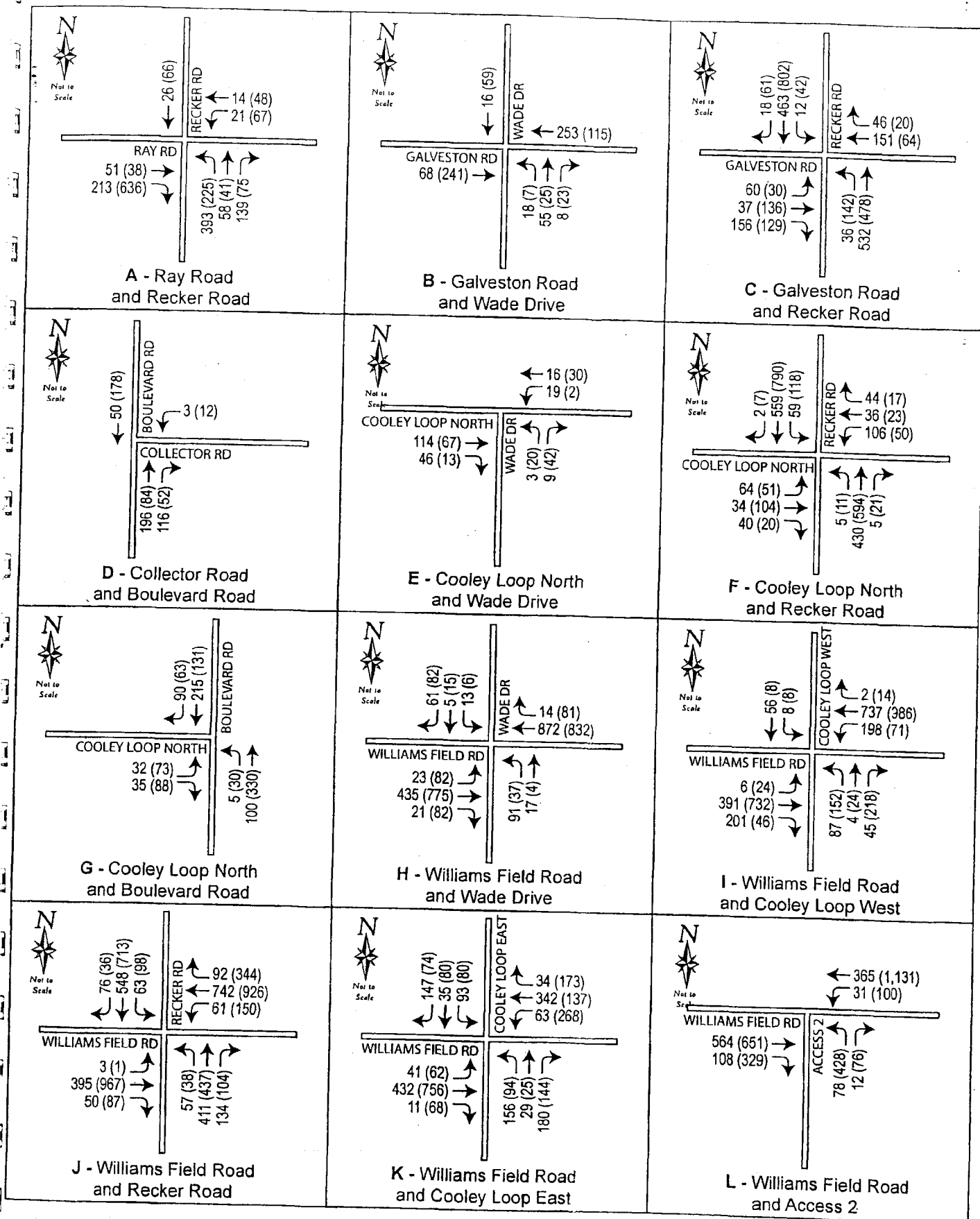
**LEGEND:**  
**Z** : Average Daily Traffic (in bold face)

**TASK**  
 ENGINEERING

Average Daily Study Area Traffic

Cooley Station Traffic Impact Study

Figure 4  
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Cooley Station Traffic Impact Study

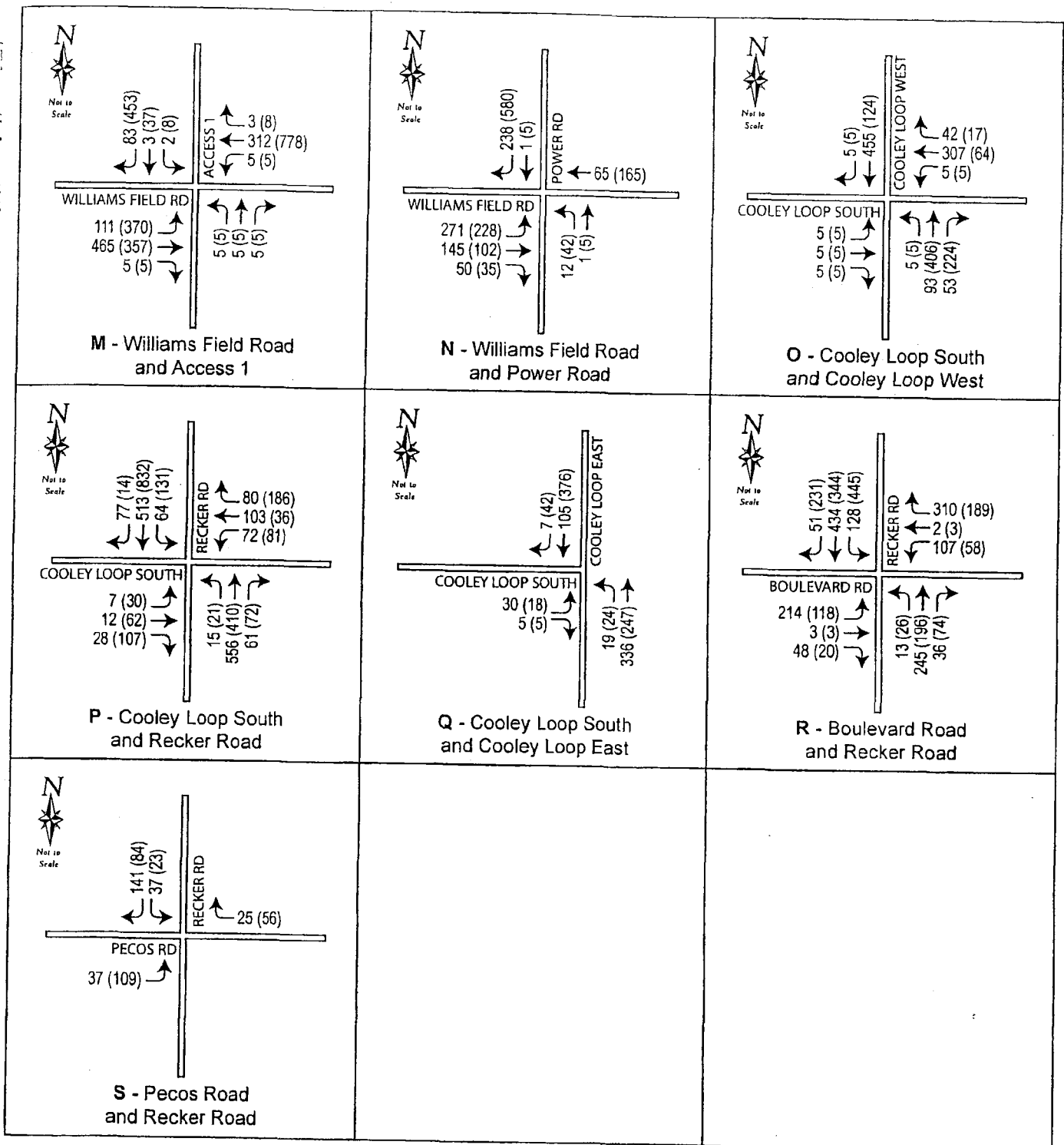
AM (PM) Peak Hour Study Area Traffic

Figure 5-1

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Cooley Station Traffic Impact Study

This procedure produces turn volumes, which minimizes the following objective function:

$$\text{Min. } K = \Sigma(V_E - V_C)^2 + 0.5 \times \Sigma(T_E - T_C)^2$$

Subject to:    Total approach volume = Total departure volume  
                  Approach volumes are held constant  
                  All turns are non-negative  
                  Approach and departure volumes are summation of turn volumes

Where:         $V_E, V_C$  = Estimated and output approach and departure volumes  
                   $T_E, T_C$  = Estimated and output turning volumes for each approach.

Before running the optimization routine, total approach and departure volumes are balanced. This approach was used to estimate background traffic for Year 2025.

The resulting background average daily traffic for Year 2015 is shown on Figure 6, while the resulting average daily traffic for Year 2025 is shown on Figure 7, with AM and PM peak hour turning movements for Year 2025 shown on Figure 8.

## TOTAL TRAFFIC

Total traffic is the sum of the site traffic plus the background traffic. Total estimated Year 2015 average daily traffic is shown on Figure 9. Total estimated average daily traffic for Year 2025 is shown on Figure 10, with AM and PM peak hour turning movements shown on Figure 11 for Year 2025.

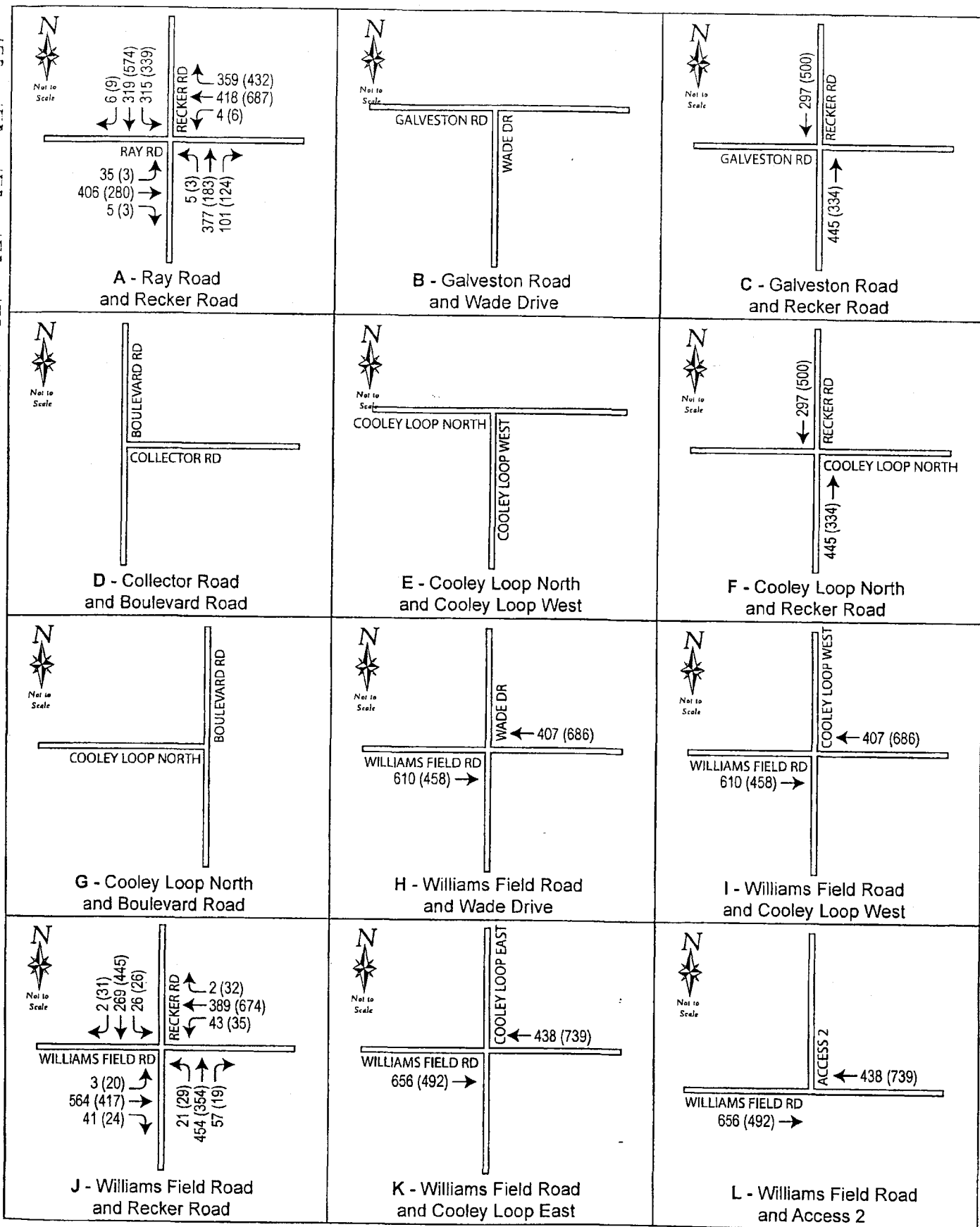
## TRAFFIC ANALYSIS

For Year 2015, generalized average daily service volumes by level of service (LOS) were used to estimate needed lanes. These daily service volumes were taken from Table 4-2 of *Quality/Level of Service Handbook*, prepared by State of Florida Department of Transportation, 2002. Excerpts from this publication are found in Appendix E. Level of service C was used to determine the break point between two-lane and four-lane roads, and Level of service D volume was used to determine the break between four-lane and six-lane roads. Roads operating at the low end of the range of service volumes are not recommended to have medians. These are minor arterials or collectors. The resulting recommended lanes for Year 2015 are found on Figure 12.

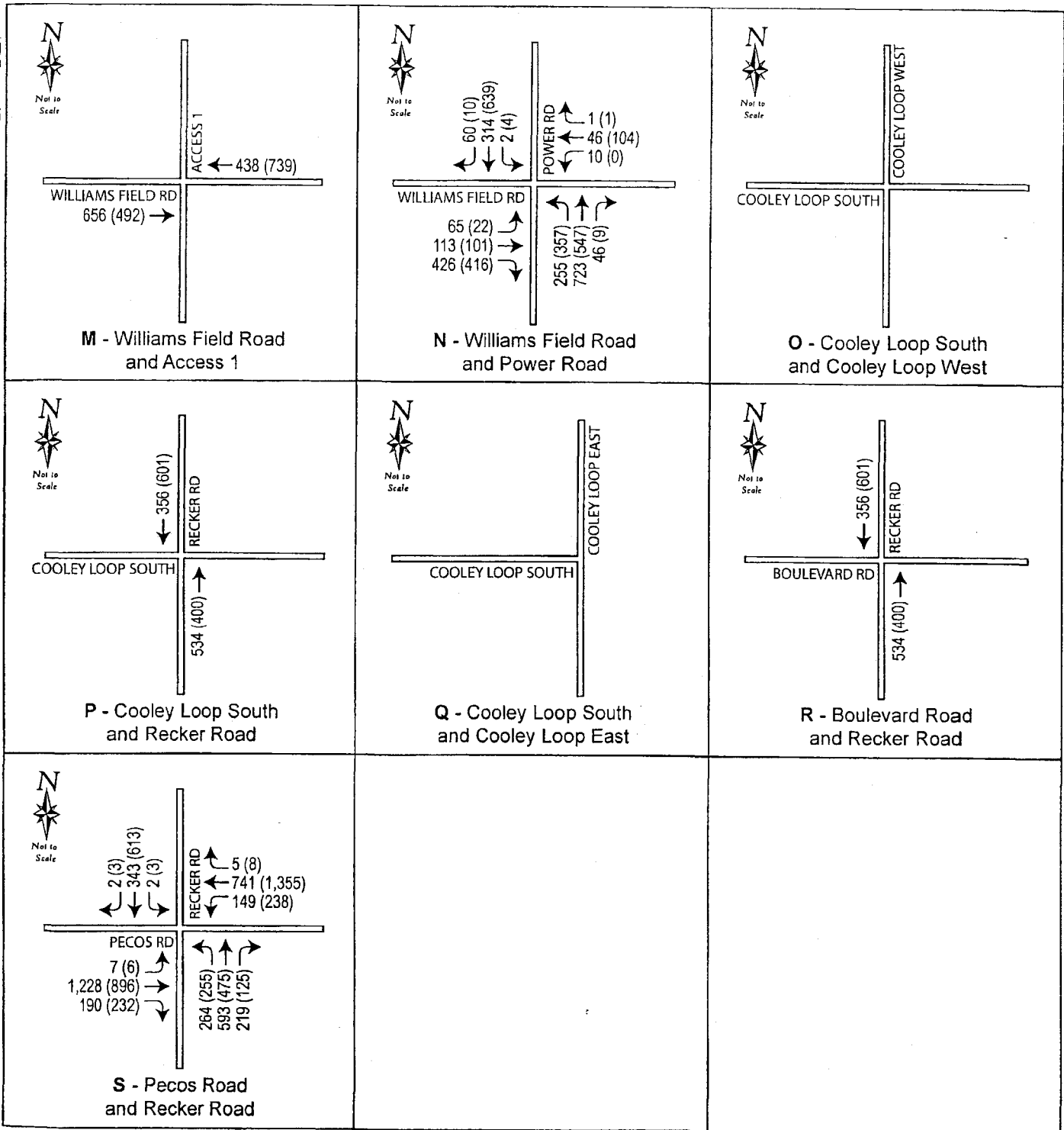
For Year 2025, the critical intersections were analyzed using the methodologies presented in the *Highway Capacity Manual, 2000 Edition*, and were evaluated using *HCS 2000 Software*. Capacity analysis was completed for both AM and PM peak hours for total Year 2025 traffic including full site buildout conditions.

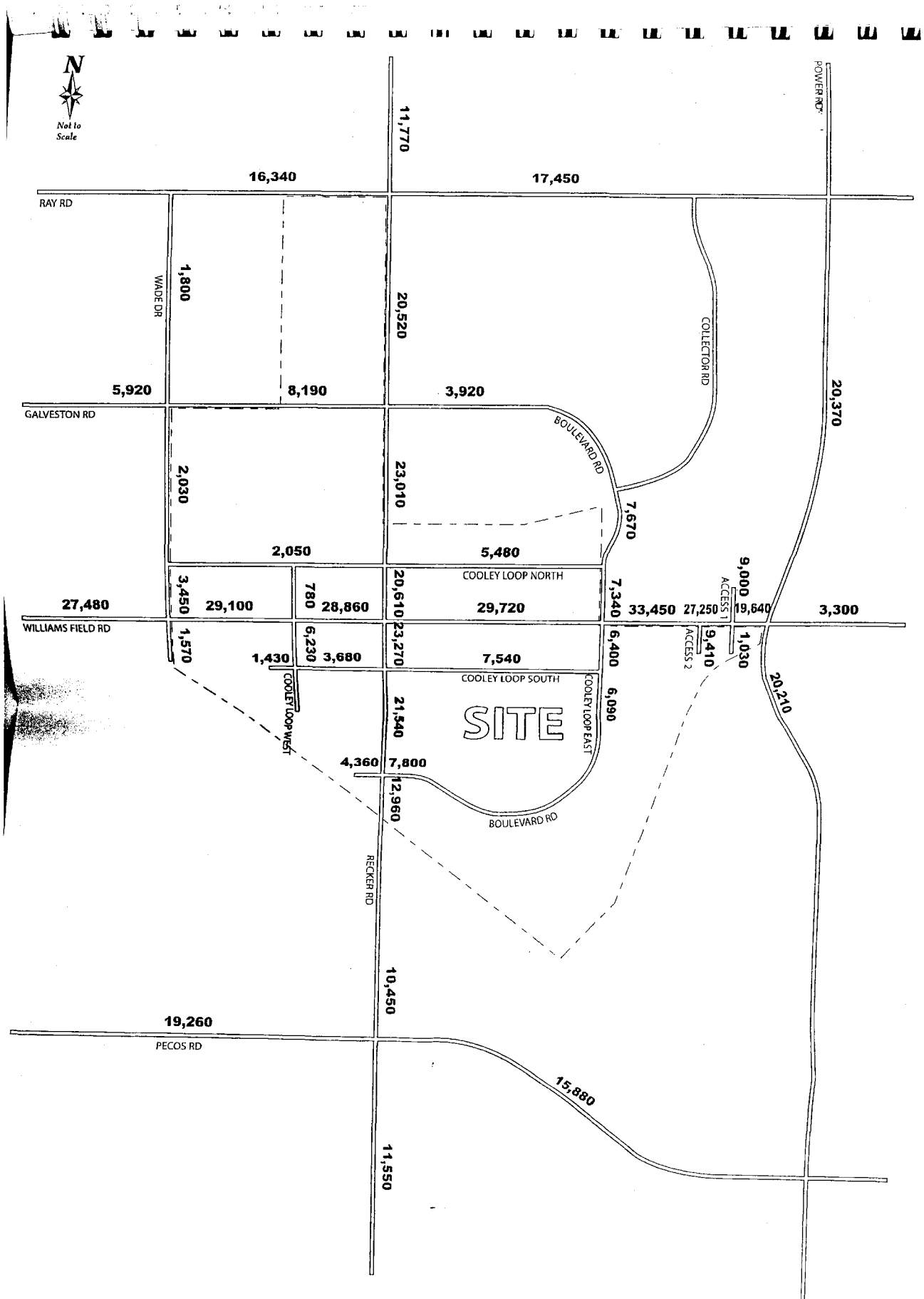






Cooley Station Traffic Impact Study





LEGEND:  
Z : Average Daily Traffic (in bold font)

**TASK**  
ENGINEERING

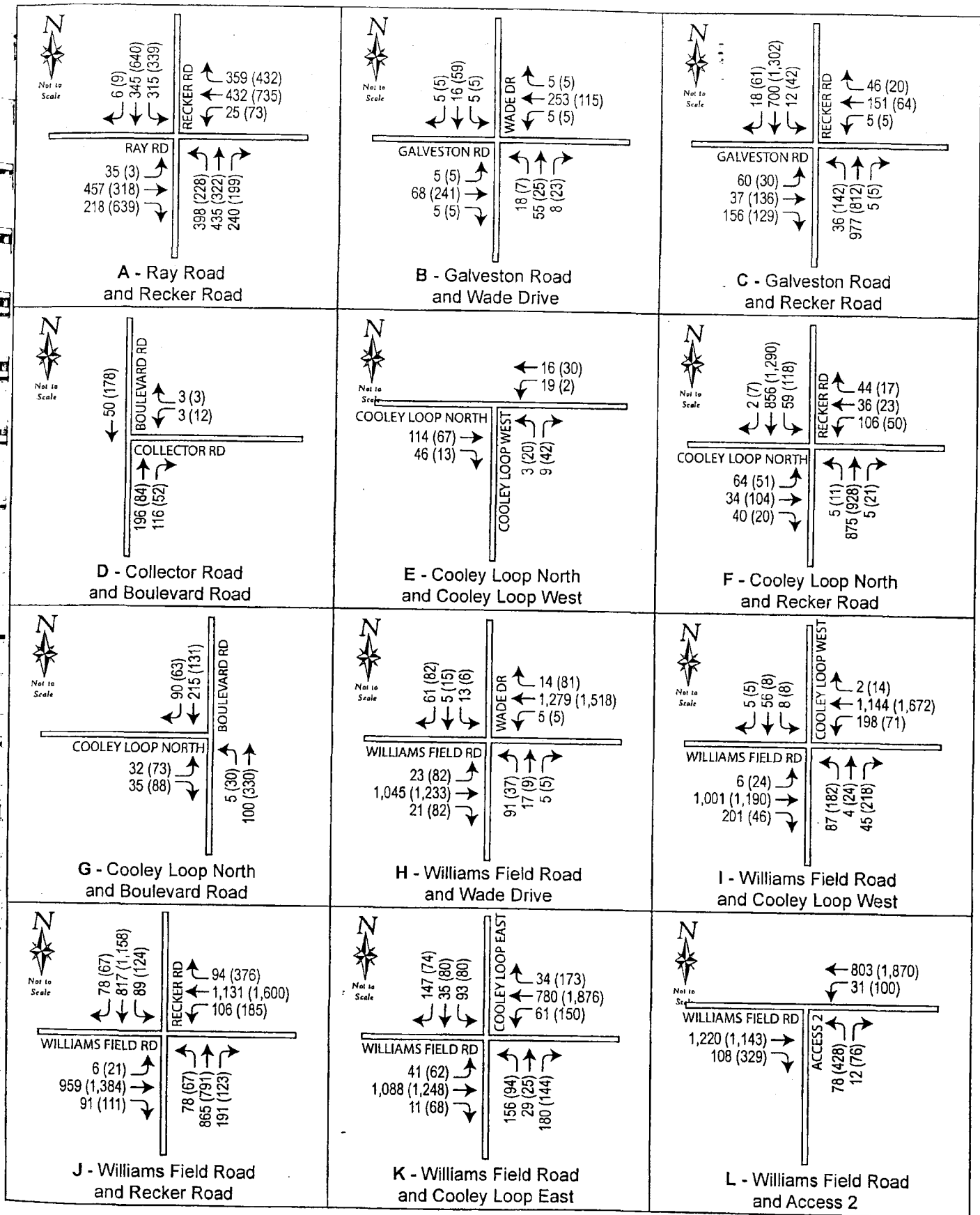
Average Daily Total Traffic  
(Year 2015)

Cooley Station Traffic Impact Study

Figure 9  
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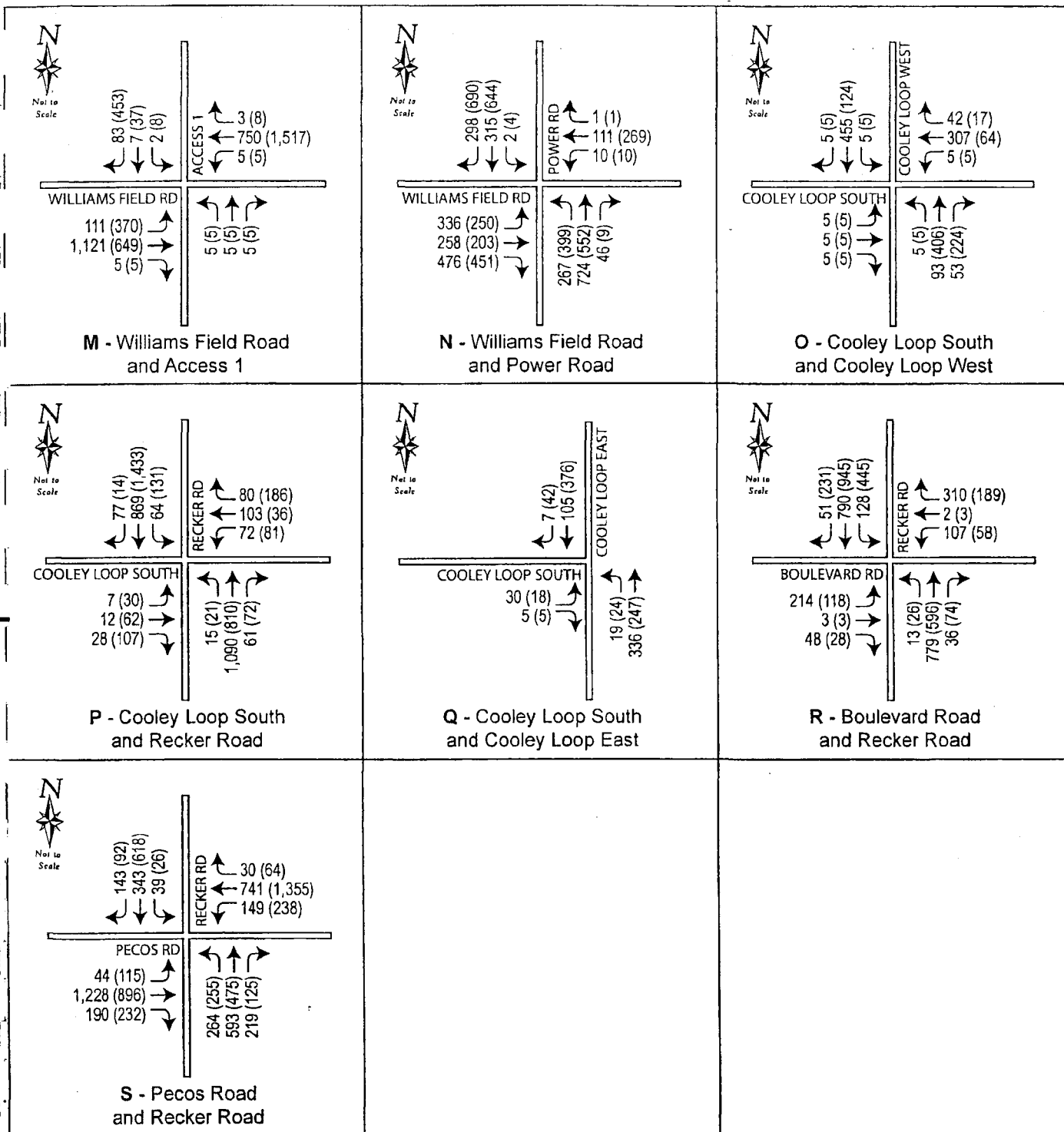




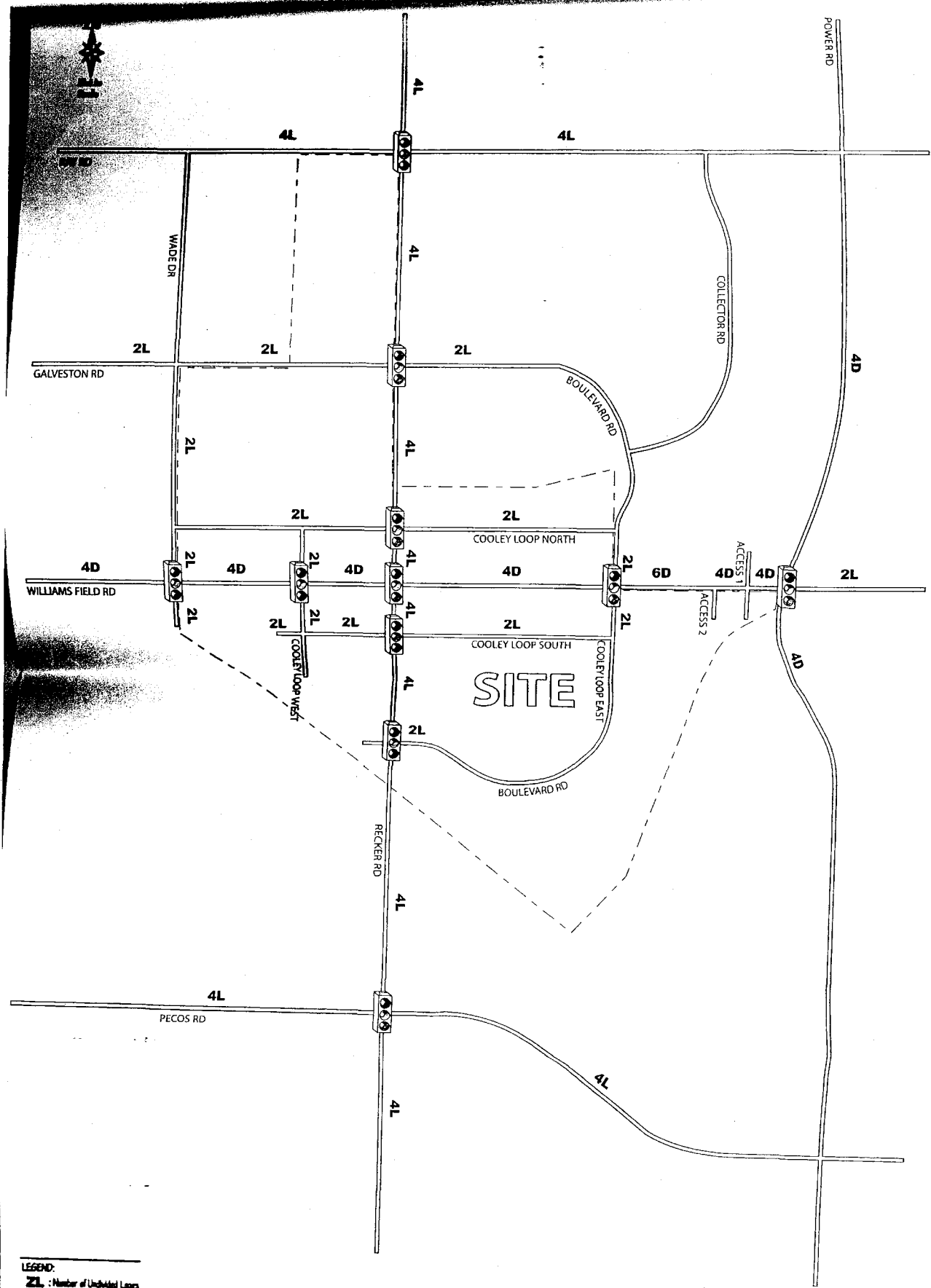
Cooley Station Traffic Impact Study

AM (PM) Peak Hour Total Traffic  
(Year 2025)

Figure 11-1  
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Cooley Station Traffic Impact Study



Signalized intersection analysis is based on control delay. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. The level of service (LOS) criteria for signalized intersection analysis is presented in Table 4. The signalized intersection analysis used a cycle length of 94 seconds.

Unsignalized intersections were analyzed as STOP sign controlled intersections using the unsignalized intersection portion of the HCS 2000 Software. The LOS for the "worst" turning movements is reported for unsignalized intersections. Usually, this is the left turn from the minor street or access drive. The LOS criterion for unsignalized intersections is reported in Table 5.

All unsignalized intersections were analyzed as full access intersections. STOP sign control was set on the minor street approach.

Most of the study intersections will operate at an LOS C or better under future conditions, with two exceptions.

The unsignalized intersection of Cooley Loop South and Cooley Loop West experiences an LOS E in the morning peak hour for northbound left turns. In addition, the signalized intersection of Williams Field Road and Recker Road experiences an LOS D in the evening peak hour.

The resulting levels of service are shown on Figure 13 for Year 2025 conditions. HCS worksheet summaries are included in Appendix A.

## DESIGN ISSUES

### Proposed Roundabouts

Roundabouts are proposed at several locations throughout the Cooley Station development, including several located along Boulevard Road between Cooley Loop South and Recker Road. All are on local or collector streets. If the outside radius of the circular roadway is between 100 and 110 feet, the roundabouts will provide adequate capacity, improved safety and trucks and fire trucks will be able to maneuver through them.

**Table 4**  
**Level of Service Criteria for**  
**Signalized Intersections**

*Cooley Station Traffic Impact Study*

Level of Service	Control Delay (sec./veh.)
A	≤ 10.0
B	> 10.0 and ≤ 20.0
C	> 20.0 and ≤ 35.0
D	> 35.0 and ≤ 55.0
E	> 55.0 and ≤ 80.0
F	> 80.0

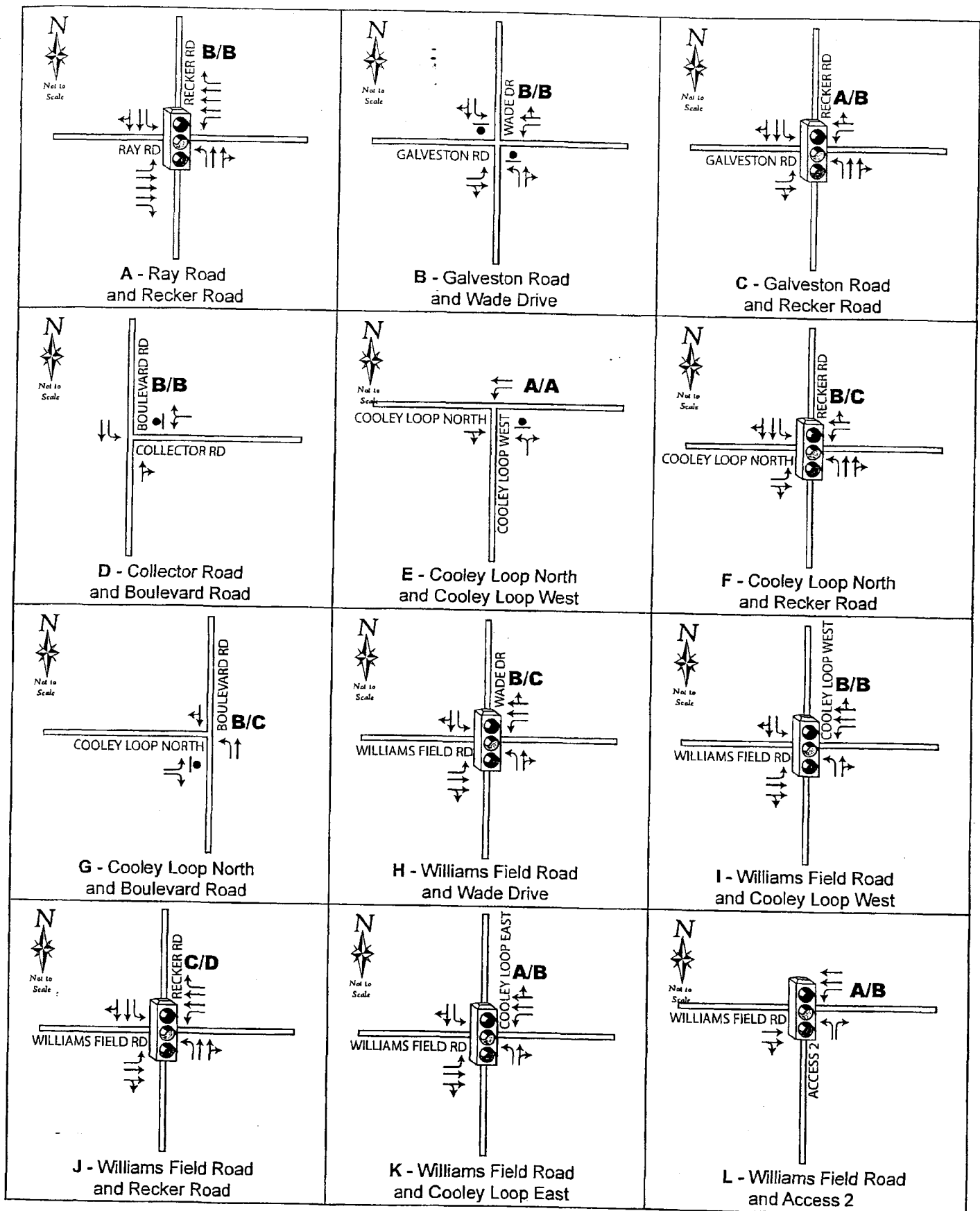
Source: Exhibit 16-2, *Highway Capacity Manual 2000*,  
Transportation Research Board

**Table 5**  
**Level of Service Criteria for**  
**Unsignalized Intersections**

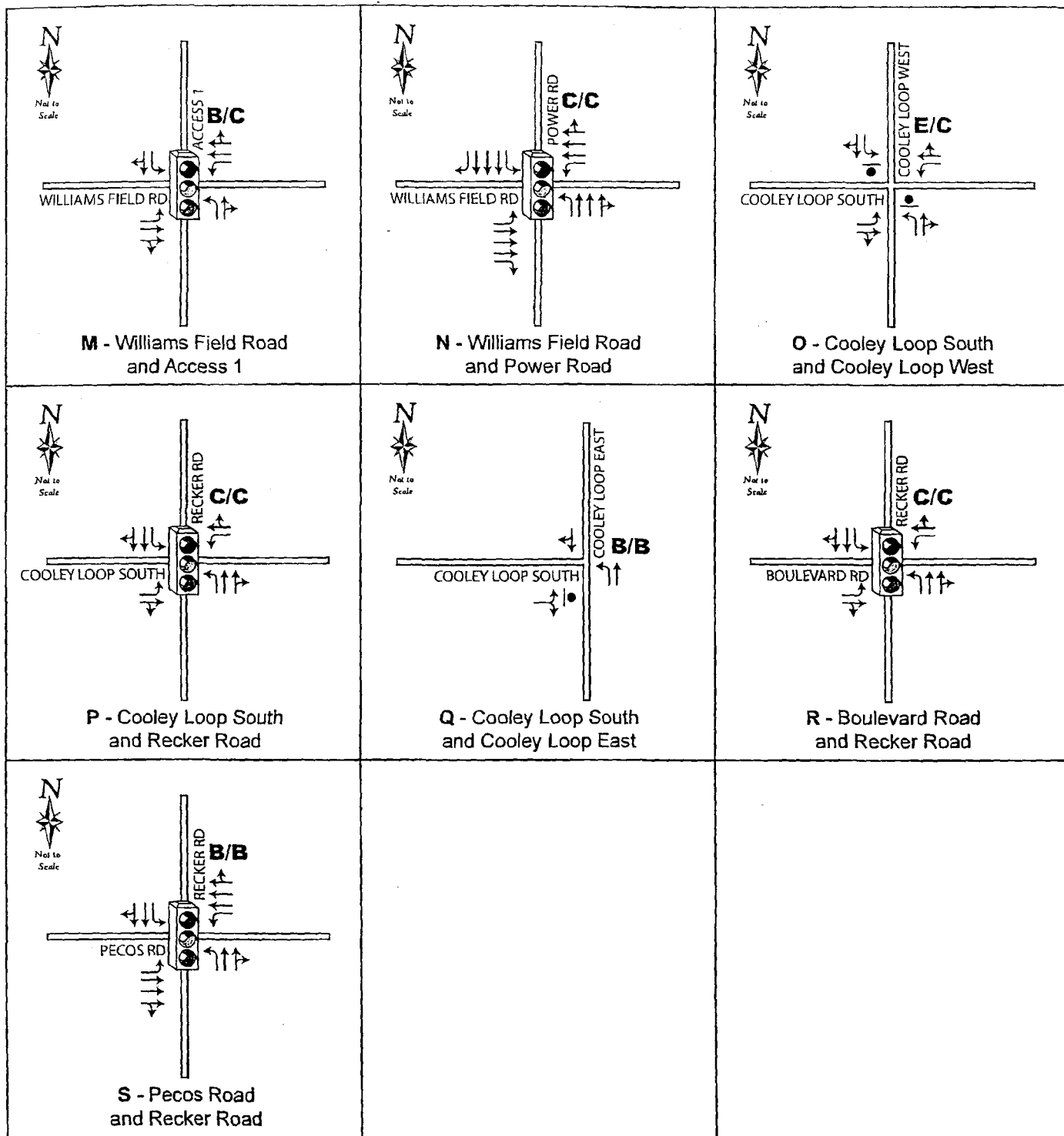
*Cooley Station Traffic Impact Study*

Level of Service	Control Delay (sec./veh.)
A	≤ 10.0
B	> 10.0 and ≤ 15.0
C	> 15.0 and ≤ 25.0
D	> 25.0 and ≤ 35.0
E	> 35.0 and ≤ 50.0
F	> 50.0

Source: Exhibit 17-2, *Highway Capacity Manual 2000*, Transportation  
Research Board.



Cooley Station Traffic Impact Study



Cooley Station Traffic Impact Study

## Right Turn Lanes

Right turn deceleration lanes are justified at the following locations due to high volumes of right turns:

- Power Road at Williams Field Road (southbound to westbound and eastbound to southbound)
- Recker Road at Ray Road (westbound to northbound and eastbound to southbound).

These are right turn lanes at signalized intersections that will experience high peak hour turning volumes and for which the right turn lanes result in an overall reduction in delay.

## SIGNAL WARRANT ANALYSIS

The Maricopa Department of Transportation (MCDOT) has adopted guidelines for determining if traffic signals are warranted on the basis of estimates of average daily traffic (ADT). These are established by Policy/Procedure Guideline 4-4.6. These guidelines extrapolate the traffic signal warrants of the Manual on Uniform Traffic Control Devices (MUTCD) to estimates of total daily volumes. The guidelines are found in Appendix H.

### Year 2015

These procedures were utilized with the average daily traffic volumes for Year 2015 at the following intersections:

- Williams Field Road at Cooley Loop East
- Recker Road at Cooley Loop North
- Recker Road at Williams Field Road
- Recker Road at Cooley Loop South
- Recker Road at Boulevard Road
- Williams Field Road at Cooley Loop West

Signal warrants were not completed for the following intersections since signals currently exist at these intersections:

- Recker Road at Ray Road
- Recker Road at Pecos Road
- Williams Field Road at Power Road

Table 6 compares approach volumes and warranting volumes for the above referenced intersections.

**Table 6**  
**Traffic Signal Needs Using ADT Volume Warrant (Year 2015)**

*Cooley Station Traffic Impact Study*

Intersection	Williams Field Road at Cooley Loop East	Recker Road at Cooley Loop North	Recker Road at Williams Field Road
Major Street ADT	31,585	21,810	29,290
Major Street Warranting ADT	12,000	12,000	12,000
Minor Street Approach ADT	7,340	5,480	23,270
Minor Street Warranting Volume	3,000	3,000	4,000
Meets Warrant?	Yes	Yes	Yes

Intersection	Recker Road at Cooley Loop South	Williams Field Road at Cooley Loop West	Recker Road at Boulevard Road
Major Street ADT	22,405	28,980	17,250
Major Street Warranting ADT	12,000	12,000	12,000
Minor Street Approach ADT	7,540	6,230	7,800
Minor Street Warranting Volume	3,000	3,000	3,000
Meets Warrant?	Yes	Yes	Yes

As can be seen from Table 6, the following intersections are anticipated to meet traffic signal warrants for Year 2015 conditions:

- Williams Field Road at Cooley Loop East
- Recker Road at Cooley Loop North
- Recker Road at Williams Field Road
- Recker Road at Cooley Loop South
- Recker Road at Boulevard Road
- Williams Field Road at Cooley Loop West

#### **Year 2025**

These procedures were utilized with the average daily traffic volumes for Year 2025 at the following intersections:

- Recker Road at Galveston Road
- Williams Field Road at Wade Drive
- Williams Field Road at Access 2
- Williams Field Road at Access 1

Table 7 compares approach volumes and warranting volumes for the above referenced intersections.



**Table 7**  
**Traffic Signal Needs Using ADT Volume Warrant (Year 2025)**

*Cooley Station Traffic Impact Study*

Intersection	Recker Road at Galveston Road	Williams Field Road at Wade Drive
Major Street ADT	24,575	29,830
Major Street Warranting ADT	12,000	12,000
Minor Street Approach ADT	8,190	3,450
Minor Street Warranting Volume	3,000	3,000
Meets Warrant?	Yes	Yes

Intersection	Williams Field Road at Access 1	Williams Field Road at Access 2
Major Street ADT	28,185	33,225
Major Street Warranting ADT	12,000	12,000
Minor Street Approach ADT	9,000	9,410
Minor Street Warranting Volume	3,000	3,000
Meets Warrant?	Yes	Yes

As can be seen from Table 7, the following intersections are anticipated to meet traffic signal warrants for Year 2025 conditions:

- Recker Road at Galveston Road
- Williams Field Road at Wade Drive
- Williams Field Road at Access 2
- Williams Field Road at Access 1.

## RECOMMENDATIONS

The proposed site is a mixed residential and commercial site that will generate an estimated 117,006 total trip ends per day, with 4,373 morning peak hour outbound trips total and 6,100 evening peak hour inbound trips total. The traffic disperses in such a way that it can be accommodated on the internal driveway and connecting arterial system with the following recommended improvements. Recommendations are shown on Figure 12 for Year 2015 and Figure 13 for Year 2025. Town of Gilbert standard cross sections are found in Appendix F.

### Year 2015 Conditions:

- The following roadways are recommended to be four-lane, divided roadways for Year 2015:
  - Williams Field Road (west of Cooley Loop East and east of Access 2)
  - Power Road

- Williams Field Road between Cooley Loop East and Access 2 is recommended to have three lanes in each direction.
- The following roadways are recommended to be four-lane roadways for Year 2015 conditions:
  - Ray Road
  - Recker Road
- The following roadways are recommended to be four-lane roadways for Year 2015 conditions:
  - Galveston Road
  - Boulevard Road
  - Wade Drive
  - Cooley Loop
  - Williams Field Road (east of Power Road).
- Locations where traffic signals are expected to be warranted by 2015 are shown on Figure 12, and include the following:
  - Williams Field Road at Cooley Loop East
  - Recker Road at Cooley Loop North
  - Recker Road at Williams Field Road
  - Recker Road at Cooley Loop South
  - Recker Road at Boulevard Road
  - Williams Field Road at Cooley Loop West

#### **Year 2025 Conditions:**

- Right turn deceleration lanes are recommended at the following locations:
  - Power Road at Williams Field Road (southbound to westbound and eastbound to southbound)
  - Recker Road at Ray Road (westbound to northbound and eastbound to southbound).
- The internal collector streets should be designed in accordance with the Town of Gilbert design standards.
- Power Road and Ray Road are recommended to be six-lane roadways per the Town of Gilbert standards.
- The proposed roundabouts, including several located along Boulevard Road between Cooley Loop South and Recker Road are recommended to have an outside radius of the circular roadway between 100 and 110 feet. The roundabouts will provide

adequate capacity, improved safety and trucks and fire trucks will be able to maneuver through them.

- Additional traffic signals are recommended at the following locations for Year 2025 (recommendations are shown on Figure 13-1 and Figure 13-2):
  - Recker Road at Galveston Road
  - Williams Field Road at Wade Drive
  - Williams Field Road at Access 2
  - Williams Field Road at Access 1

**APPENDIX A:**  
**CAPACITY SUMMARIES**

1/8/2006

## HCS+™ DETAILED REPORT

## General Information

Analyst SAD  
 Agency or Co. TASK Eng  
 Date Performed 11/8/2006  
 Time Period

## Site Information

Intersection Recker Rd at Ray Road  
 Area Type All other areas  
 Jurisdiction Gilbert  
 Analysis Year  
 Project ID Recker Road at Ray Road AM Pk  
 Hr-2025

## Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, N <sub>i</sub>	1	3	1	1	3	1	1	2	0	1	2	0
Approach Group	L	T	R	L	T	R	L	TR		L	TR	
Volume, V (vph)	35	457	218	25	432	359	398	435	240	315	345	6
Heavy Vehicles, %HV	0	0	0	0	0	0	0	0	0	0	0	0
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Controlled (P) or Actuated (A)	A	A	A	A	A	A	A	A	A	A	A	A
Start-up Lost Time, l <sub>i</sub>	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Extension of Effective Green, e	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Arrival Type, AT	3	3	3	3	3	3	3	3		3	3	
Left Extension, UE	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Filtering/Metering, I	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000		1.000	1.000	
Initial Unmet Demand, Q <sub>b</sub>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Ped / Bike / RTOR Volumes	0	0	60	0	0	0	0	0	40	0	0	0
Approach Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0		12.0	12.0	
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking Maneuvers, N <sub>m</sub>												
Trucks Stopping, N <sub>s</sub>	0	0	0	0	0	0	0	0		0	0	
Min. Time for Pedestrians, G <sub>p</sub>	3.2			3.2			3.2			3.2		

Phasing	EW Perm	02	03	04	NS Perm	Excl. Left	07	08
Timing	G = 27.0 Y = 4	G = Y =	G = Y =	G = Y =	G = 25.0 Y = 4	G = 10.4 Y = 4	G = Y =	G = Y =
Duration of Analysis, T = 0.25						Cycle Length, C = 74.4		

## Approach Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, v	38	497	172	27	470	390	433	690		342	382	
Approach Group Capacity, c	314	1878	586	301	1878	586	655	1158		514	1212	
Capacity Ratio, X	0.12	0.26	0.29	0.09	0.25	0.67	0.66	0.60		0.67	0.32	
Initial Green Ratio, g/C	0.36	0.36	0.36	0.36	0.36	0.36	0.53	0.34		0.53	0.34	
Uniform Delay, d <sub>1</sub>	15.8	16.7	16.9	15.6	16.6	19.9	16.2	20.5		21.1	18.3	
Progression Factor, PF	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000		1.000	1.000	
Delay Calibration, k	0.11	0.11	0.11	0.11	0.11	0.24	0.24	0.18		0.24	0.11	
Incremental Delay, d <sub>2</sub>	0.2	0.1	0.3	0.1	0.1	2.9	2.5	0.8		3.3	0.2	
Initial Queue Delay, d <sub>3</sub>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay	16.0	16.8	17.2	15.7	16.7	22.8	18.7	21.3		24.4	18.5	
Approach Group LOS	B	B	B	B	B	C	B	C		C	B	
Approach Delay	16.8			19.3			20.3			21.3		
Approach LOS	B			B			C			C		
Intersection Delay	19.6			X <sub>c</sub> = 0.76			Intersection LOS			B		

11/8/2006

## BACK-OF-QUEUE WORKSHEET

## General Information

Project Description Recker Road at Ray Road AM Pk Hr-2025

## Average Back of Queue

	EB			WB			NB			SB	
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH
Lane Group	L	T	R	L	T	R	L	TR		L	TR
Initial Queue/Lane	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Flow Rate/Lane Group	38	497	172	27	470	390	433	690		342	382
Satflow/Lane	864	1900	1615	830	1900	1615	1238	1810		971	1894
Capacity/Lane Group	314	1878	586	301	1878	586	655	1158		514	1212
Flow Ratio	0.0	0.1	0.1	0.0	0.1	0.2	0.3	0.2		0.4	0.1
v/c Ratio	0.12	0.26	0.29	0.09	0.25	0.67	0.66	0.60		0.67	0.32
I Factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000		1.000	1.000
Arrival Type	3	3	3	3	3	3	3	3		3	3
Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00
PF Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00
Q1	0.5	2.7	2.5	0.4	2.5	6.8	4.8	6.2		3.8	3.1
ka	0.3	0.5	0.4	0.3	0.5	0.4	0.5	0.5		0.4	0.5
Q2	0.0	0.2	0.2	0.0	0.2	0.9	0.9	0.7		0.8	0.2
Q Average	0.6	2.8	2.7	0.4	2.7	7.6	5.7	6.9		4.6	3.3

## Percentile Back of Queue (95th percentile)

fe%	2.1	2.0	2.0	2.1	2.0	1.9	1.9	1.9		2.0	2.0
Back of Queue	1.2	5.7	5.5	0.8	5.4	14.4	11.1	13.1		9.1	6.6

## Queue Storage Ratio

Queue Spacing	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0		25.0	25.0
Queue Storage	0	0	0	0	0	0	0	0		0	0
Average Queue Storage Ratio											
95% Queue Storage Ratio											

8/2006

## TWO-WAY STOP CONTROL SUMMARY

General Information				Site Information			
Analyst	MG			Intersection	Galveston Rd at Wade Drive		
Agency/Co.	TASK Eng			Jurisdiction	Gilbert		
Date Performed	8/8/2006			Analysis Year	2025		
Analysis Time Period	AM PK Hr-2025						
Project Description: Galveston Road at Wade Drive AM PK Hr-2025							
East/West Street: Galveston Road				North/South Street: Wade Drive			
Intersection Orientation: East-West				Study Period (hrs): 0.25			
<b>Vehicle Volumes and Adjustments</b>							
Major Street		Eastbound			Westbound		
Movement	1	2	3	4	5	6	
	L	T	R	L	T	R	
Volume (veh/h)	5	68	5	5	253	5	
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly Flow Rate, HFR (veh/h)	5	73	5	5	274	5	
Percent Heavy Vehicles	0	-	-	0	-	-	
Median Type		Undivided					
Channelized			0			0	
Lanes	1	1	0	1	1	0	
Configuration	L		TR	L		TR	
Stream Signal		0			0		
Minor Street		Northbound			Southbound		
Movement	7	8	9	10	11	12	
	L	T	R	L	T	R	
Volume (veh/h)	18	55	8	5	16	5	
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly Flow Rate, HFR (veh/h)	19	59	8	5	17	5	
Percent Heavy Vehicles	0	0	0	0	0	0	
Percent Grade (%)	0			0			
Driveway Approach		N			N		
Storage		0			0		
RT Channelized			0			0	
Lanes	1	1	0	1	1	0	
Configuration	L		TR	L		TR	
<b>Delay, Queue Length, and Level of Service</b>							
Approach		Eastbound	Westbound	Northbound		Southbound	
Movement	1	4	7	8	9	10	11
Configuration	L	L	L		TR	L	TR
Volume (veh/h)	5	5	19		67	5	22
Sum (veh/h)	1295	1533	558		586	508	593
	0.00	0.00	0.03		0.11	0.01	0.04
% queue length	0.01	0.01	0.11		0.38	0.03	0.12
Control Delay (s/veh)	7.8	7.4	11.7		11.9	12.2	11.3
LOS	A	A	B		B	B	B
Approach Delay (s/veh)	-	-	11.9		11.5		
Approach LOS	-	-	B		B		

11/8/2006

## TWO-WAY STOP CONTROL SUMMARY

General Information				Site Information			
Analyst	MG			Intersection	Galveston Rd at Wade Drive		
Agency/Co.	TASK Eng			Jurisdiction	Gilbert		
Date Performed	8/8/2006			Analysis Year	2025		
Analysis Time Period	AM PK Hr-2025						
Project Description Galveston Road at Wade Drive AM Pk Hr-2025							
East/West Street: Galveston Road				North/South Street: Wade Drive			
Intersection Orientation: East-West				Study Period (hrs): 0.25			
<b>Vehicle Volumes and Adjustments</b>							
Major Street	Eastbound			Westbound			
Movement	1	2	3	4	5	6	
	L	T	R	L	T	R	
Volume (veh/h)	5	68	5	5	253	5	
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly Flow Rate, HFR (veh/h)	5	73	5	5	274	5	
Percent Heavy Vehicles	0	-	-	0	-	-	
Median Type	Undivided						
RT Channelized			0			0	
Lanes	1	1	0	1	1	0	
Configuration	L		TR	L		TR	
Upstream Signal		0			0		
Minor Street	Northbound			Southbound			
Movement	7	8	9	10	11	12	
	L	T	R	L	T	R	
Volume (veh/h)	18	55	8	5	16	5	
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly Flow Rate, HFR (veh/h)	19	59	8	5	17	5	
Percent Heavy Vehicles	0	0	0	0	0	0	
Percent Grade (%)	0			0			
Flared Approach	N			N			
Storage	0			0			
RT Channelized			0			0	
Lanes	1	1	0	1	1	0	
Configuration	L		TR	L		TR	
<b>Delay, Queue Length, and Level of Service</b>							
Approach	Eastbound	Westbound	Northbound			Southbound	
Movement	1	4	7	8	9	10	11
Lane Configuration	L	L	L		TR	L	
v (veh/h)	5	5	19		67	5	
C (m) (veh/h)	1295	1533	558		586	508	
v/c	0.00	0.00	0.03		0.11	0.01	
95% queue length	0.01	0.01	0.11		0.38	0.03	
Control Delay (s/veh)	7.8	7.4	11.7		11.9	12.2	
LOS	A	A	B		B	B	
Approach Delay (s/veh)	-	-	11.9			11.5	
Approach LOS	-	-	B			B	



11/8/2006

## TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	MG	Intersection	Galveston Rd at Wade Drive
Agency/Co.	TASK Eng	Jurisdiction	Gilbert
Date Performed	8/8/2006	Analysis Year	2025
Analysis Time Period	PM PK Hr-2025		

Project Description Galveston Road at Wade Drive PM PK Hr-2025

East/West Street: Galveston Road

North/South Street: Wade Drive

Intersection Orientation: East-West

Study Period (hrs): 0.25

## Vehicle Volumes and Adjustments

Major Street Movement	Eastbound			Westbound		
	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	5	241	5	5	115	5
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR (veh/h)	5	261	5	5	124	5
Percent Heavy Vehicles	0	—	—	0	—	—
Median Type	Undivided					
Channelized			0			0
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR
Stream Signal		0			0	

Minor Street Movement	Northbound			Southbound		
	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	7	25	23	5	59	5
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR (veh/h)	7	27	24	5	64	5
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)	0			0		
Driveway Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR

## Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
	1	4	7	8	9	10	11	12
Configuration	L	L	L		TR	L		TR
Volume (veh/h)	5	5	7		51	5		69
Flow (veh/h)	1469	1310	473		623	496		546
PHF	0.00	0.00	0.01		0.08	0.01		0.13
% queue length	0.01	0.01	0.05		0.27	0.03		0.43
Control Delay (s/veh)	7.5	7.8	12.7		11.3	12.3		12.5
LOS	A	A	B		B	B		B
Approach Delay (s/veh)	—	—	11.5			12.5		
Approach LOS	—	—	B			B		

1/8/2006

## HCS+™ DETAILED REPORT

## General Information

Analyst JL  
 Agency or Co. TASK Engineering  
 Date Performed 11/7/2006  
 Time Period

## Site Information

Intersection Galveston Road/Recker Road  
 Area Type All other areas  
 Jurisdiction Gilbert  
 Analysis Year  
 Project ID Galveston Road at Recker Road AM  
 Pk Hr-2025

## Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, $N_i$	1	1	0	1	1	0	1	2	0	1	2	0
Lane Group	L	TR		L	TR		L	TR		L	TR	
Volume, $V$ (vph)	60	37	156	5	151	46	36	977	5	12	700	0
Heavy Vehicles, %HV	0	0	0	0	0	0	0	0	0	0	0	0
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Pretimed (P) or Actuated (A)	A	A	A	A	A	A	A	A	A	A	A	A
Start-up Lost Time, $l_i$	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Extension of Effective Green, $e$	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Arrival Type, AT	3	3		3	3		4	4		4	4	
Init Extension, UE	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Filtering/Metering, $f_i$	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Initial Unmet Demand, $Q_b$	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Ped / Bike / RTOR Volumes	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking Maneuvers, $N_m$												
Buses Stopping, $N_b$	0	0		0	0		0	0		0	0	
Min. Time for Pedestrians, $G_p$	3.2			3.2			3.2			3.2		
Phasing	EW Perm	02	03	04	NS Perm	06	07	08				
Timing	G = 19.0	G =	G =	G =	G = 33.0	G =	G =	G =				
	Y = 4	Y =	Y =	Y =	Y = 4	Y =	Y =	Y =				
Duration of Analysis, $T = 0.25$							Cycle Length, $C = 60.0$					

## Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, $v$	67	214		6	219		40	1092		13	798	
Lane Group Capacity, $c$	341	529		345	581		351	1988		234	1982	
w/c Ratio, $X$	0.20	0.40		0.02	0.38		0.11	0.55		0.06	0.40	
Total Green Ratio, $g/C$	0.32	0.32		0.32	0.32		0.55	0.55		0.55	0.55	
Uniform Delay, $d_1$	14.9	16.1		14.1	15.9		6.5	8.7		6.3	7.8	
Progression Factor, PF	1.000	1.000		1.000	1.000		0.681	0.681		0.681	0.681	
Delay Calibration, $k$	0.11	0.11		0.11	0.11		0.11	0.15		0.11	0.11	
Incremental Delay, $d_2$	0.3	0.5		0.0	0.4		0.1	0.3		0.1	0.1	
Initial Queue Delay, $d_3$	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay	15.2	16.6		14.1	16.3		4.6	6.3		4.4	5.5	
Lane Group LOS	B	B		B	B		A	A		A	A	
Approach Delay	16.3			16.3			6.2			5.4		
Approach LOS	B			B			A			A		
Intersection Delay	8.0			$X_c = 0.50$			Intersection LOS			A		

/8/2006

## BACK-OF-QUEUE WORKSHEET

## General Information

Project Description Galveston Road at Recker Road AM Pk Hr-2025

## Average Back of Queue

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane Group	L	TR		L	TR		L	TR		L	TR	
Initial Queue/Lane	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Flow Rate/Lane Group	67	214		6	219		40	1092		13	798	
Flow/Lane	1076	1670		1090	1834		638	1898		425	1892	
Capacity/Lane Group	341	529		345	581		351	1988		234	1982	
Flow Ratio	0.1	0.1		0.0	0.1		0.1	0.3		0.0	0.2	
Capacity Ratio	0.20	0.40		0.02	0.38		0.11	0.55		0.06	0.40	
Factor	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Arrival Type	3	3		3	3		4	4		4	4	
Platoon Ratio	1.00	1.00		1.00	1.00		1.33	1.33		1.33	1.33	
Factor	1.00	1.00		1.00	1.00		0.61	0.69		0.60	0.65	
Q1	0.8	2.8		0.1	2.8		0.2	4.3		0.1	2.6	
	0.3	0.4		0.3	0.4		0.3	0.6		0.2	0.6	
Q2	0.1	0.2		0.0	0.2		0.0	0.7		0.0	0.4	
Average	0.9	3.0		0.1	3.1		0.2	4.9		0.1	3.0	

## Percentile Back of Queue (95th percentile)

	2.1	2.0		2.1	2.0		2.1	2.0		2.1	2.0	
Back of Queue	1.8	6.1		0.2	6.2		0.5	9.6		0.2	6.1	

## Queue Storage Ratio

Queue Spacing	25.0	25.0		25.0	25.0		25.0	25.0		25.0	25.0	
Queue Storage	0	0		0	0		0	0		0	0	
Average Queue Storage Ratio												
% Queue Storage Ratio												

11/8/2006

## TWO-WAY STOP CONTROL SUMMARY

General Information				Site Information			
Analyst	MG			Intersection	Collector Rd at Boulevard Rd		
Agency/Co.	TASK Eng			Jurisdiction	Gilbert		
Date Performed	8/8/2006			Analysis Year	2025		
Analysis Time Period	AM PK Hr-2025						
Project Description Collector Road at Boulevard Rd AM Pk Hr-2025							
East/West Street: Collector Road				North/South Street: Boulevard Road			
Intersection Orientation: East-West				Study Period (hrs): 0.25			
<b>Vehicle Volumes and Adjustments</b>							
Major Street	Eastbound			Westbound			
Movement	1	2	3	4	5	6	
	L	T	R	L	T	R	
Volume (veh/h)				3		2	
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly Flow Rate, HFR (veh/h)	0	0	0	3	0	2	
Percent Heavy Vehicles	0	-	-	0	-	-	
Median Type	Undivided						
RT Channelized			0			0	
Lanes	0	0	0	0	0	0	
Configuration				LTR	LR		
Upstream Signal		0			0		
Minor Street	Northbound			Southbound			
Movement	7	8	9	10	11	12	
	L	T	R	L	T	R	
Volume (veh/h)		196	116	3	50		
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly Flow Rate, HFR (veh/h)	0	213	126	3	54	0	
Percent Heavy Vehicles	0	0	0	0	0	0	
Percent Grade (%)	0			0			
Flared Approach		N			N		
Storage		0			0		
RT Channelized			0			0	
Lanes	0	1	0	1	1	0	
Configuration			TR	L	T		
<b>Delay, Queue Length, and Level of Service</b>							
Approach	Eastbound	Westbound	Northbound			Southbound	
Movement	1	4	7	8	9	10	11
Lane Configuration		LTR			TR	L	T
v (veh/h)		3			339	3	54
C (m) (veh/h)		1636			955	569	890
v/c		0.00			0.35	0.01	0.06
95% queue length		0.01			1.62	0.02	0.19
Control Delay (s/veh)		7.2			10.8	11.4	9.3
LOS		A			B	B	A
Approach Delay (s/veh)	-	-	10.8			9.4	
Approach LOS	-	-	B			A	

8/2006

## TWO-WAY STOP CONTROL SUMMARY

General Information			Site Information	
Analyst	MG		Intersection	Collector Rd at Boulevard Rd
Agency/Co.	TASK Eng		Jurisdiction	Gilbert
Date Performed	8/8/2006		Analysis Year	2025
Analysis Time Period	PM PK Hr-2025			

Project Description Collector Road at Boulevard Rd PM Pk Hr-2025

East/West Street: Collector Road

North/South Street: Boulevard Road

Intersection Orientation: East-West

Study Period (hrs): 0.25

## Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)				12		2
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR (veh/h)	0	0	0	13	0	2
Percent Heavy Vehicles	0	-	-	0	-	-
Median Type	Undivided					
Channelized			0			0
Turn Lanes	0	0	0	0	0	0
Configuration				LTR	LR	
Stream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)		84	52	3	178	
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR (veh/h)	0	91	56	3	193	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Med Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Turn Lanes	0	1	0	1	1	0
Configuration			TR	L	T	

## Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Line Configuration		LTR			TR	L	T	
Volume (veh/h)		13			147	3	193	
Flow (veh/h)		1636			937	767	863	
Queue Length		0.01			0.16	0.00	0.22	
Control Delay (s/veh)		0.02			0.56	0.01	0.86	
LOS		7.2			9.6	9.7	10.4	
Approach Delay (s/veh)	-	A			A	A	B	
Approach LOS	-	-			9.6		10.4	
	-	-			A		B	

11/8/2006

## TWO-WAY STOP CONTROL SUMMARY

General Information			Site Information	
Analyst	MG	Intersection	Cooley Loop N./Cooley Loop W.	
Agency/Co.	TASK Eng	Jurisdiction	Gilbert	
Date Performed	8/8/2006	Analysis Year	2025	
Analysis Time Period	AM PK Hr-2025			

Project Description Cooley Loop North at Cooley Loop West AM Pk Hr-2025

East/West Street: Cooley Loop North

North/South Street: Cooley Loop West

Intersection Orientation: East-West

Study Period (hrs): 0.25

## Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		114	46	19	16	
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR (veh/h)	0	123	49	20	17	0
Percent Heavy Vehicles	0	-	-	0	-	-
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	0	1	1	0
Configuration			TR	L	T	
Upstream Signal		0		0		
Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	3		9			
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR (veh/h)	3	0	9	0	0	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	0	0	0	0
Configuration		LR				

## Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L		LR				
v (veh/h)		20		12				
C (m) (veh/h)		1417		869				
v/c		0.01		0.01				
95% queue length		0.04		0.04				
Control Delay (s/veh)		7.6		9.2				
LOS		A		A				
Approach Delay (s/veh)	-	-		9.2				
Approach LOS	-	-		A				

1/8/2006

## TWO-WAY STOP CONTROL SUMMARY

General Information				Site Information				
Analyst	MG			Intersection	Cooley Loop N./Cooley Loop W.			
Agency/Co.	TASK Eng			Jurisdiction	Gilbert			
Date Performed	8/8/2006			Analysis Year	2025			
Analysis Time Period	PM PK Hr-2025							
Project Description: Cooley Loop North at Cooley Loop West PM Pk Hr-2025								
East/West Street: Cooley Loop North				North/South Street: Cooley Loop West				
Intersection Orientation: East-West				Study Period (hrs): 0.25				
Vehicle Volumes and Adjustments								
Major Street	Eastbound			Westbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume (veh/h)		67	13	2	30			
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92		
Hourly Flow Rate, HFR (veh/h)	0	72	14	2	32	0		
Percent Heavy Vehicles	0	-	-	0	-	-		
Median Type	Undivided							
Channelized			0			0		
Lanes	0	1	0	1	1	0		
Configuration			TR	L	T			
Stream Signal		0			0			
Minor Street	Northbound			Southbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume (veh/h)	20		42					
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92		
Hourly Flow Rate, HFR (veh/h)	21	0	45	0	0	0		
Percent Heavy Vehicles	0	0	0	0	0	0		
Percent Grade (%)		0			0			
Driveway Approach		N			N			
Storage		0			0			
RT Channelized			0			0		
Lanes	0	0	0	0	0	0		
Configuration		LR						
Delay, Queue Length, and Level of Service								
Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Line Configuration		L		LR				
Volume (veh/h)		2		66				
Queue (veh)		1523		952				
% queue length		0.00		0.07				
Control Delay (s/veh)		0.00		0.22				
LOS		7.4		9.1				
Approach Delay (s/veh)		A		A				
Approach LOS		-		9.1				
		-		A				

11/8/2006

## HCS+™ DETAILED REPORT

General Information				Site Information			
Analyst	MG			Intersection	Recker Rd/ Cooley Loop North		
Agency or Co.	TASK Eng			Area Type	All other areas		
Date Performed	8/8/2006			Jurisdiction	Gilbert		
Time Period				Analysis Year			
				Project ID	Recker Road at Cooley Loop North AM Pk Hr-2025		

Volume and Timing Input											
	EB			WB			NB			SB	
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH
Number of Lanes, N <sub>i</sub>	1	1	0	1	1	0	1	2	0	1	2
Lane Group	L	TR		L	TR		L	TR		L	TR
Volume, V (vph)	64	34	40	106	36	44	5	875	5	59	856
% Heavy Vehicles, %HV	0	0	0	0	0	0	0	0	0	0	0
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Pretimed (P) or Actuated (A)	A	A	A	A	A	A	A	A	A	A	A
Start-up Lost Time, t <sub>l</sub>	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0
Extension of Effective Green, e	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0
Arrival Type, AT	3	3		3	3		3	3		3	3
Unit Extension, UE	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0
Filtering/Metering, I	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000
Initial Unmet Demand, Q <sub>b</sub>	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0
Ped / Bike / RTOR Volumes	0	0	0	0	0	0	0	0	0	0	0
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N	N	0
Parking Maneuvers, N <sub>m</sub>											
Buses Stopping, N <sub>b</sub>	0	0		0	0		0	0		0	0
Min. Time for Pedestrians, G <sub>p</sub>	3.2			3.2			3.2			3.2	
Phasing	EW Perm	Excl. Left	03	04		NS Perm	Excl. Left		07	08	
Timing	G = 25.1	G = 3.0	G =	G =		G = 32.1	G = 5.4		G =	G =	
	Y = 4	Y = 0	Y =	Y =		Y = 4	Y = 0		Y =	Y =	
Duration of Analysis, T = 0.25							Cycle Length, C = 73.6				

Lane Group Capacity, Control Delay, and LOS Determination											
	EB			WB			NB			SB	
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH
Adjusted Flow Rate, v	70	80		115	87		5	956		64	932
Lane Group Capacity, c	581	596		588	594		363	1577		355	1577
v/c Ratio, X	0.12	0.13		0.20	0.15		0.01	0.61		0.18	0.59
Total Green Ratio, g/C	0.44	0.34		0.44	0.34		0.56	0.44		0.56	0.44
Uniform Delay, d <sub>1</sub>	13.9	16.7		14.2	16.8		15.5	15.9		17.7	15.8
Progression Factor, PF	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000
Delay Calibration, k	0.11	0.11		0.11	0.11		0.11	0.19		0.11	0.18
Incremental Delay, d <sub>2</sub>	0.1	0.1		0.2	0.1		0.0	0.7		0.2	0.6
Initial Queue Delay, d <sub>3</sub>	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0
Control Delay	14.0	16.8		14.4	16.9		15.5	16.6		18.0	16.4
Lane Group LOS	B	B		B	B		B	B		B	B
Approach Delay	15.5			15.5			16.6			16.5	
Approach LOS	B			B			B			B	
Intersection Delay	16.4			X <sub>c</sub> = 0.38			Intersection LOS			B	



1/8/2006

# BACK-OF-QUEUE WORKSHEET

## General Information

Project Description Recker Road at Cooley Loop North AM Pk Hr-2025

## Average Back of Queue

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane Group	L	TR		L	TR		L	TR		L	TR	
Initial Queue/Lane	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Flow Rate/Lane Group	70	80		115	87		5	956		64	932	
Outflow/Lane	1332	1747		1347	1743		642	1898		629	1899	
Capacity/Lane Group	581	596		588	594		363	1577		355	1577	
Flow Ratio	0.1	0.0		0.1	0.0		0.0	0.3		0.1	0.3	
Ratio	0.12	0.13		0.20	0.15		0.01	0.61		0.18	0.59	
Factor	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Arrival Type	3	3		3	3		3	3		3	3	
Adaptation Ratio	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
	0.8	1.1		1.4	1.2		0.0	7.9		0.6	7.6	
	0.4	0.4		0.4	0.4		0.3	0.5		0.3	0.5	
	0.1	0.1		0.1	0.1		0.0	0.8		0.1	0.8	
Average	0.9	1.2		1.5	1.3		0.0	8.7		0.7	8.4	

## Percentile Back of Queue (95th percentile)

	2.1	2.1		2.1	2.1		2.1	1.9		2.1	1.9	
Back of Queue	1.8	2.5		3.0	2.7		0.1	16.3		1.4	15.7	

## Queue Storage Ratio

Queue Spacing	25.0	25.0		25.0	25.0		25.0	25.0		25.0	25.0	
Queue Storage	0	0		0	0		0	0		0	0	
Average Queue Storage Ratio												
% Queue Storage Ratio												

11/8/2006

## HCS+™ DETAILED REPORT

## General Information

Analyst MG  
 Agency or Co. TASK Eng  
 Date Performed 8/8/2006  
 Time Period

## Site Information

Intersection Recker Rd/ Cooley Loop North  
 Area Type All other areas  
 Jurisdiction Gilbert  
 Analysis Year  
 Project ID Recker Road at Cooley Loop North  
 PM Pk Hr-2025

## Volume and Timing Input

			EB			WB			NB			SB		
			LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, N <sub>i</sub>			1	1	0	1	1	0	1	2	0	1	2	0
Lane Group			L	TR		L	TR		L	TR		L	TR	
Volume, V (vph)			51	104	20	50	23	17	11	928	21	118	1290	2
% Heavy Vehicles, %HV			0	0	0	0	0	0	0	0	0	0	0	0
Peak-Hour Factor, PHF			0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Pretimed (P) or Actuated (A)			A	A	A	A	A	A	A	A	A	A	A	A
Start-up Lost Time, I <sub>i</sub>			2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Extension of Effective Green, e			2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Arrival Type, AT			3	3		3	3		3	3		3	3	
Unit Extension, UE			3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Filtering/Metering, I			1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Initial Unmet Demand, Q <sub>b</sub>			0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Ped / Bike / RTOR Volumes			0	0	0	0	0	0	0	0	0	0	0	0
Lane Width			12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Parking / Grade / Parking			N	0	N	N	0	N	N	0	N	N	0	N
Parking Maneuvers, N <sub>m</sub>														
Buses Stopping, N <sub>b</sub>			0	0		0	0		0	0		0	0	
Min. Time for Pedestrians, G <sub>p</sub>			3.2			3.2			3.2			3.2		
Phasing	EW Perm	Excl. Left	03			04		NS Perm		Excl. Left		07		08
Timing	G = 25.1	G = 3.0	G =			G =		G = 32.1		G = 5.4		G =		G =
	Y = 4	Y = 0	Y =			Y =		Y = 4		Y = 0		Y =		Y =
Duration of Analysis, T = 0.25									Cycle Length, C = 73.6					

## Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, v	55	135		54	43		12	1032		128	1410	
Lane Group Capacity, c	622	632		539	607		334	1573		334	1577	
v/c Ratio, X	0.09	0.21		0.10	0.07		0.04	0.66		0.38	0.89	
Total Green Ratio, g/C	0.44	0.34		0.44	0.34		0.56	0.44		0.56	0.44	
Uniform Delay, d <sub>1</sub>	12.9	17.2		14.6	16.4		24.8	16.4		22.3	19.2	
Progression Factor, PF	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Delay Calibration, k	0.11	0.11		0.11	0.11		0.11	0.23		0.11	0.42	
Incremental Delay, d <sub>2</sub>	0.1	0.2		0.1	0.0		0.0	1.0		0.7	7.0	
Initial Queue Delay, d <sub>3</sub>	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay	13.0	17.4		14.7	16.4		24.8	17.4		23.0	26.2	
Lane Group LOS	B	B		B	B		C	B		C	C	
Approach Delay	16.1			15.5			17.5			25.9		
Approach LOS	B			B			B			C		
Intersection Delay	21.9			X <sub>c</sub> = 0.55			Intersection LOS			C		

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## BACK-OF-QUEUE WORKSHEET

## General Information

Project Description Recker Road at Cooley Loop North PM Pk Hr-2025

## Storage Back of Queue

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Group	L	TR		L	TR		L	TR		L	TR	
Initial Queue/Lane	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Arrival Rate/Lane Group	55	135		54	43		12	1032		128	1410	
Flow/Lane	1426	1854		1234	1781		592	1893		592	1898	
Capacity/Lane Group	622	632		539	607		334	1573		334	1577	
Down Ratio	0.0	0.1		0.0	0.0		0.0	0.3		0.2	0.4	
Ratio	0.09	0.21		0.10	0.07		0.04	0.66		0.38	0.89	
Factor	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Initial Type	3	3		3	3		3	3		3	3	
Ratio	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
	0.6	2.0		0.6	0.6		0.1	8.8		1.2	14.0	
	0.5	0.5		0.4	0.5		0.3	0.5		0.3	0.5	
	0.0	0.1		0.0	0.0		0.0	1.0		0.2	3.5	
Average	0.7	2.1		0.7	0.6		0.1	9.8		1.4	17.5	

## Percentile Back of Queue (95th percentile)

	2.1	2.0		2.1	2.1		2.1	1.8		2.1	1.7	
Back of Queue	1.4	4.2		1.4	1.3		0.3	18.1		2.9	30.2	

## Queue Storage Ratio

Queue Spacing	25.0	25.0		25.0	25.0		25.0	25.0		25.0	25.0	
Queue Storage	0	0		0	0		0	0		0	0	
Storage Queue Storage Ratio												
% Queue Storage Ratio												

8/2006

# TWO-WAY STOP CONTROL SUMMARY

General Information				Site Information			
Analyst	MG			Intersection	Cooley Loop N. at Boulevard Rd		
Agency/Co.	TASK Eng			Jurisdiction	Gilbert		
Date Performed	8/8/2006			Analysis Year	2025		
Analysis Time Period	AM PK Hr-2025						
Project Description Cooley Loop North at Boulevard Rd AM Pk Hr-2025							
East/West Street: Cooley Loop North				North/South Street: Boulevard Rd			
Intersection Orientation: East-West				Study Period (hrs): 0.25			
<b>Vehicle Volumes and Adjustments</b>							
Major Street	Eastbound			Westbound			
Movement	1	2	3	4	5	6	
	L	T	R	L	T	R	
Volume (veh/h)	32		35				
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly Flow Rate, HFR (veh/h)	34	0	38	0	0	0	
Percent Heavy Vehicles	0	-	-	0	-	-	
Median Type	Undivided						
RT Channelized			0			0	
Lanes	1	0	1	0	0	0	
Configuration	L		R				
Upstream Signal		0			0		
Minor Street	Northbound			Southbound			
Movement	7	8	9	10	11	12	
	L	T	R	L	T	R	
Volume (veh/h)	5	100			215	90	
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly Flow Rate, HFR (veh/h)	5	108	0	0	233	97	
Percent Heavy Vehicles	0	0	0	0	0	0	
Percent Grade (%)	0			0			
Flared Approach		N			N		
Storage		0			0		
RT Channelized			0			0	
Lanes	1	1	0	0	1	0	
Configuration	L	T				TR	
<b>Delay, Queue Length, and Level of Service</b>							
Approach	Eastbound	Westbound	Northbound			Southbound	
Movement	1	4	7	8	9	10	11
Lane Configuration	L		L	T			
Volume (veh/h)	34		5	108			330
CV (m) (veh/h)	1636		499	809			845
CV/c	0.02		0.01	0.13			0.02
95% queue length	0.06		0.03	0.46			1.87
Control Delay (s/veh)	7.2		12.3	10.1			12.3
LOS	A		B	B			B
Approach Delay (s/veh)	-	-	10.2			12.0	
Approach LOS	-	-	B			B	

8/2006

# TWO-WAY STOP CONTROL SUMMARY

General Information				Site Information				
Analyst	MG			Intersection				
Agency/Co.	TASK Eng			Jurisdiction		Gilbert		
Date Performed	8/8/2006			Analysis Year		2025		
Analysis Time Period	PM PK Hr-2025							
Project Description Cooley Loop North at Boulevard Rd PM Pk Hr-2025								
East/West Street: Cooley Loop North				North/South Street: Boulevard Rd				
Intersection Orientation: East-West				Study Period (hrs): 0.25				
Vehicle Volumes and Adjustments								
Major Street	Eastbound			Westbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume (veh/h)	73		88					
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92		
Hourly Flow Rate, HFR (veh/h)	79	0	95	0	0	0		
Percent Heavy Vehicles	0	-	-	0	-	-		
Median Type	Undivided							
Channelized			0			0		
Phases	1	0	1	0	0	0		
Configuration	L		R					
Stream Signal		0			0			
Minor Street	Northbound			Southbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume (veh/h)	30	330			131	63		
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92		
Hourly Flow Rate, HFR (veh/h)	32	358	0	0	142	68		
Percent Heavy Vehicles	0	0	0	0	0	0		
Percent Grade (%)	0			0				
Red Approach		N			N			
Storage		0			0			
RT Channelized			0			0		
Phases	1	1	0	0	1	0		
Configuration	L	T				TR		
Delay, Queue Length, and Level of Service								
Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Line Configuration	L		L	T				TR
Volume (veh/h)	79		32	358				210
Flow (veh/h)	1636		517	702				723
Delay (s/veh)	0.05		0.06	0.51				0.29
Queue length	0.15		0.20	2.92				1.21
Control Delay (s/veh)	7.3		12.4	15.3				12.0
LOS	A		B	C				B
Approach Delay (s/veh)	-	-	15.1			12.0		
Approach LOS	-	-	C			B		

11/8/2006

## HCS+™ DETAILED REPORT

General Information				Site Information	
Analyst	MG			Intersection	Williams Field Rd/Wade Drive
Agency or Co.	TASK Eng			Area Type	All other areas
Date Performed	8/8/2006			Jurisdiction	Gilbert
Time Period				Analysis Year	
				Project ID	Williams Field Road at Wade Drive AM Pk Hr-2025

Volume and Timing Input												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, N <sub>i</sub>	1	2	0	1	2	0	1	1	0	1	1	
Lane Group	L	TR		L	TR		L	TR		L	TR	
Volume, V (vph)	23	1045	21	5	1279	14	91	17	5	13	5	
% Heavy Vehicles, %HV	0	0	0	0	0	0	0	0	0	0	0	
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0
Pretimed (P) or Actuated (A)	A	A	A	A	A	A	A	A	A	A	A	
Start-up Lost Time, l <sub>i</sub>	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Extension of Effective Green, e	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Arrival Type, AT	3	3		3	3		3	3		3	3	
Unit Extension, UE	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Filtering/Metering, I	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Initial Unmet Demand, Q <sub>b</sub>	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Ped / Bike / RTOR Volumes	0	0	0	0	0	0	0	0	40	0	0	
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N	N	0	
Parking Maneuvers, N <sub>m</sub>												
Buses Stopping, N <sub>b</sub>	0	0		0	0		0	0		0	0	
Min. Time for Pedestrians, G <sub>p</sub>	3.2			3.2			3.2			3.2		
Phasing	EW Perm	02	03	04	NS Perm	06	07	08				
Timing	G = 37.2	G =	G =	G =	G = 20.0	G =	G =	G =				
	Y = 4	Y =	Y =	Y =	Y = 4	Y =	Y =	Y =				
Duration of Analysis, T = 0.25							Cycle Length, C = 65.2					

## Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, v	25	1159		5	1405		99	18		14	60	
Lane Group Capacity, c	122	2058		192	2061		418	583		435	503	
v/c Ratio, X	0.20	0.56		0.03	0.68		0.24	0.03		0.03	0.12	
Total Green Ratio, g/C	0.57	0.57		0.57	0.57		0.31	0.31		0.31	0.31	
Uniform Delay, d <sub>1</sub>	6.8	8.9		6.1	9.8		16.9	15.8		15.8	16.3	
Progression Factor, PF	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Delay Calibration, k	0.11	0.16		0.11	0.25		0.11	0.11		0.11	0.11	
Incremental Delay, d <sub>2</sub>	0.8	0.4		0.1	0.9		0.3	0.0		0.0	0.1	
Initial Queue Delay, d <sub>3</sub>	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay	7.6	9.2		6.2	10.8		17.2	15.8		15.9	16.4	
Lane Group LOS	A	A		A	B		B	B		B	B	
Approach Delay	9.2			10.8			17.0			16.3		
Approach LOS	A			B			B			B		
Intersection Delay	10.5			X <sub>c</sub> = 0.53			Intersection LOS			B		

11/8/2006

# BACK-OF-QUEUE WORKSHEET

## General Information

Project Description Williams Field Road at Wade Drive AM Pk Hr-2025

## Average Back of Queue

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane Group	L	TR		L	TR		L	TR		L	TR	
Initial Queue/Lane	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Flow Rate/Lane Group	25	1159		5	1405		99	18		14	60	
Flow/Lane	213	1894		337	1897		1364	1900		1417	1639	
Capacity/Lane Group	122	2058		192	2061		418	583		435	503	
Flow Ratio	0.1	0.3		0.0	0.4		0.1	0.0		0.0	0.0	
Ratio	0.20	0.56		0.03	0.68		0.24	0.03		0.03	0.12	
Factor	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Initial Type	3	3		3	3		3	3		3	3	
Ratio	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
21	0.2	7.0		0.0	9.4		1.3	0.2		0.2	0.8	
	0.2	0.6		0.2	0.6		0.3	0.4		0.3	0.4	
22	0.0	0.8		0.0	1.2		0.1	0.0		0.0	0.1	
Average	0.3	7.7		0.0	10.6		1.4	0.2		0.2	0.8	

## Percentile Back of Queue (95th percentile)

	2.1	1.9		2.1	1.8		2.1	2.1		2.1	2.1	
Back of Queue	0.5	14.6		0.1	19.5		3.0	0.5		0.4	1.7	

## Queue Storage Ratio

Queue Spacing	25.0	25.0		25.0	25.0		25.0	25.0		25.0	25.0	
Queue Storage	0	0		0	0		0	0		0	0	
Storage Queue Storage Ratio												
95% Queue Storage Ratio												

1/8/2006

## HCS+™ DETAILED REPORT

## General Information

Analyst MG  
 Agency or Co. TASK Eng  
 Date Performed 8/8/2006  
 Time Period

## Site Information

Intersection Williams Field Rd/Wade Drive  
 Area Type All other areas  
 Jurisdiction Gilbert  
 Analysis Year  
 Project ID Williams Field Road at Wade Drive  
 PM Pk Hr-2025

## Volume and Timing Input

			EB			WB			NB			SB		
			LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, N <sub>i</sub>			1	2	0	1	2	0	1	1	0	1	1	0
Lane Group			L	TR		L	TR		L	TR		L	TR	
Volume, V (vph)			82	1233	82	5	1518	81	37	9	5	6	15	
% Heavy Vehicles, %HV			0	0	0	0	0	0	0	0	0	0	0	
Peak-Hour Factor, PHF			0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Pretimed (P) or Actuated (A)			A	A	A	A	A	A	A	A	A	A	A	
Start-up Lost Time, l <sub>i</sub>			2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Extension of Effective Green, e			2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Arrival Type, AT			3	3		3	3		3	3		3	3	
Unit Extension, UE			3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Filtering/Metering, I			1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Initial Unmet Demand, Q <sub>b</sub>			0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Ped / Bike / RTOR Volumes			0	0	0	0	0	0	0	0	0	0	0	0
Lane Width			12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Parking / Grade / Parking			N	0	N	N	0	N	N	0	N	N	0	N
Parking Maneuvers, N <sub>m</sub>														
Buses Stopping, N <sub>b</sub>			0	0		0	0		0	0		0	0	
Min. Time for Pedestrians, G <sub>p</sub>			3.2			3.2			3.2			3.2		
Phasing	EW Perm	EB Only	03		04		NS Perm		06		07		08	
Timing	G = 37.2	G = 5.0	G =		G =		G = 20.0		G =		G =		G =	
	Y = 4	Y = 4	Y =		Y =		Y = 4		Y =		Y =		Y =	
Duration of Analysis, T = 0.25									Cycle Length, C = 74.2					

## Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, $v$	89	1429		5	1738		40	15		7	105	
Lane Group Capacity, $c$	321	1797		102	1800		353	487		383	447	
v/c Ratio, $X$	0.28	0.80		0.05	0.97		0.11	0.03		0.02	0.23	
Total Green Ratio, $g/C$	0.62	0.50		0.50	0.50		0.27	0.27		0.27	0.27	
Uniform Delay, $d_1$	26.3	15.3		9.5	17.9		20.4	20.0		19.9	21.1	
Progression Factor, PF	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Delay Calibration, $k$	0.11	0.34		0.11	0.47		0.11	0.11		0.11	0.11	
Incremental Delay, $d_2$	0.5	2.6		0.2	14.0		0.1	0.0		0.0	0.3	
Initial Queue Delay, $d_3$	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay	26.8	17.9		9.7	31.8		20.6	20.0		19.9	21.4	
Lane Group LOS	C	B		A	C		C	B		B	C	
Approach Delay	18.4			31.8			20.4			21.3		
Approach LOS	B			C			C			C		
Intersection Delay	25.3			$X_c = 0.61$			Intersection LOS			C		



1/8/2006

## BACK-OF-QUEUE WORKSHEET

## General Information

Project Description Williams Field Road at Wade Drive PM Pk Hr-2025

## Average Back of Queue

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane Group	L	TR		L	TR		L	TR		L	TR	
Initial Queue/Lane	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Flow Rate/Lane Group	89	1429		5	1738		40	15		7	105	
Flow/Lane	516	1882		204	1885		1309	1805		1421	1658	
Capacity/Lane Group	321	1797		102	1800		353	487		383	447	
Flow Ratio	0.2	0.4		0.0	0.5		0.0	0.0		0.0	0.1	
Capacity Ratio	0.28	0.80		0.05	0.97		0.11	0.03		0.02	0.23	
Factor	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Arrival Type	3	3		3	3		3	3		3	3	
Platoon Ratio	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
F Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
1	0.7	12.8		0.1	18.2		0.6	0.2		0.1	1.7	
	0.3	0.6		0.2	0.6		0.3	0.4		0.3	0.4	
2	0.1	2.1		0.0	6.4		0.0	0.0		0.0	0.1	
Average	0.8	14.9		0.1	24.6		0.7	0.2		0.1	1.8	

## Percentile Back of Queue (95th percentile)

	2.1	1.8		2.1	1.7		2.1	2.1		2.1	2.0	
Back of Queue	1.7	26.3		0.1	40.6		1.4	0.5		0.2	3.7	

## Queue Storage Ratio

Queue Spacing	25.0	25.0		25.0	25.0		25.0	25.0		25.0	25.0	
Queue Storage	0	0		0	0		0	0		0	0	
Average Queue Storage Ratio												
% Queue Storage Ratio												

1/8/2006

## HCS+™ DETAILED REPORT

## General Information

Analyst MG  
 Agency or Co. TASK Eng  
 Date Performed 8/8/2006  
 Time Period

## Site Information

Intersection W. Field Rd/Cooley Loop West  
 Area Type All other areas  
 Jurisdiction Gilbert  
 Analysis Year  
 Project ID Williams Field Road at Cooley Loop  
 West AM Pk Hr-2025

## Volume and Timing Input

			EB			WB			NB			SB		
			LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, N <sub>i</sub>			1	2	0	1	2	0	1	1	0	1	1	
Lane Group			L	TR		L	TR		L	TR		L	TR	
Volume, V (vph)			6	1001	201	198	1144	2	87	4	45	8	56	
% Heavy Vehicles, %HV			0	0	0	0	0	0	0	0	0	0	0	
Peak-Hour Factor, PHF			0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Pretimed (P) or Actuated (A)			A	A	A	A	A	A	A	A	A	A	A	
Start-up Lost Time, l <sub>i</sub>			2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Extension of Effective Green, e			2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Arrival Type, AT			3	3		3	3		3	3		3	3	
Unit Extension, UE			3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Filtering/Metering, I			1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Initial Unmet Demand, Q <sub>b</sub>			0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Ped / Bike / RTOR Volumes			0	0	60	0	0	0	0	0	0	0	0	0
Lane Width			12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Parking / Grade / Parking			N	0	N	N	0	N	N	0	N	N	0	N
Parking Maneuvers, N <sub>m</sub>														
Buses Stopping, N <sub>b</sub>			0	0		0	0		0	0		0	0	
Min. Time for Pedestrians, G <sub>p</sub>			3.2			3.2			3.2			3.2		
Phasing	EW Perm	WB Only	03			04		NS Perm		06		07		08
Timing	G = 37.2	G = 7.0	G =			G =		G = 25.0		G =		G =		G =
	Y = 4	Y = 4	Y =			Y =		Y = 4		Y =		Y =		Y =
Duration of Analysis, T = 0.25									Cycle Length, C = 81.2					

## Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, v	7	1241		215	1245		95	53		9	66	
Lane Group Capacity, c	118	1627		338	2147		418	504		423	578	
v/c Ratio, X	0.06	0.76		0.64	0.58		0.23	0.11		0.02	0.11	
Total Green Ratio, g/C	0.46	0.46		0.59	0.59		0.31	0.31		0.31	0.31	
Uniform Delay, d <sub>i</sub>	12.3	18.3		27.8	10.2		20.9	20.1		19.6	20.2	
Progression Factor, PF	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Delay Calibration, k	0.11	0.31		0.22	0.17		0.11	0.11		0.11	0.11	
Incremental Delay, d <sub>2</sub>	0.2	2.2		3.9	0.4		0.3	0.1		0.0	0.1	
Initial Queue Delay, d <sub>3</sub>	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay	12.5	20.5		31.8	10.6		21.2	20.2		19.6	20.2	
Lane Group LOS	B	C		C	B		C	C		B	C	
Approach Delay	20.5			13.7			20.8			20.2		
Approach LOS	C			B			C			C		
Intersection Delay	17.1			X <sub>c</sub> = 0.66			Intersection LOS			B		

1/8/2006

# BACK-OF-QUEUE WORKSHEET

## General Information

Project Description Williams Field Road at Cooley Loop West AM Pk Hr-2025

## Average Back of Queue

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Line Group	L	TR		L	TR		L	TR		L	TR	
Initial Queue/Lane	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Flow Rate/Lane Group	7	1241		215	1245		95	53		9	66	
Flow/Lane	257	1865		569	1899		1357	1637		1373	1878	
Capacity/Lane Group	118	1627		338	2147		418	504		423	578	
Flow Ratio	0.0	0.3		0.4	0.3		0.1	0.0		0.0	0.0	
Ratio	0.06	0.76		0.64	0.58		0.23	0.11		0.02	0.11	
Factor	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Arrival Type	3	3		3	3		3	3		3	3	
Platoon Ratio	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
	0.1	12.2		2.2	9.1		1.6	0.9		0.1	1.1	
	0.2	0.6		0.3	0.7		0.4	0.4		0.4	0.5	
	0.0	1.8		0.6	0.9		0.1	0.1		0.0	0.1	
Average	0.1	14.0		2.7	10.1		1.7	0.9		0.1	1.1	

## Percentile Back of Queue (95th percentile)

	2.1	1.8		2.0	1.8		2.0	2.1		2.1	2.1	
Back of Queue	0.2	24.9		5.5	18.6		3.5	1.9		0.3	2.3	

## Queue Storage Ratio

Queue Spacing	25.0	25.0		25.0	25.0		25.0	25.0		25.0	25.0	
Queue Storage	0	0		0	0		0	0		0	0	
Average Queue Storage Ratio												
% Queue Storage Ratio												

11/8/2006

## HCS+™ DETAILED REPORT

General Information						Site Information					
Analyst	MG					Intersection	W. Field Rd/Cooley Loop West				
Agency or Co.	TASK Eng					Area Type	All other areas				
Date Performed	8/8/2006					Jurisdiction	Gilbert				
Time Period						Analysis Year					
						Project ID	Williams Field Road at Cooley Loop West PM Pk Hr-2025				

Volume and Timing Input												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, N <sub>i</sub>	1	2	0	1	2	0	1	1	0	1	1	
Lane Group	L	TR		L	TR		L	TR		L	TR	
Volume, V (vph)	24	1190	46	71	1672	14	182	24	218	8	8	
% Heavy Vehicles, %HV	0	0	0	0	0	0	0	0	0	0	0	
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Pretimed (P) or Actuated (A)	A	A	A	A	A	A	A	A	A	A	A	
Start-up Lost Time, l <sub>i</sub>	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Extension of Effective Green, e	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Arrival Type, AT	3	3		3	3		3	3		3	3	
Unit Extension, UE	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Filtering/Metering, I	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Initial Unmet Demand, Q <sub>b</sub>	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Ped / Bike / RTOR Volumes	0	0	0	0	0	0	0	0	40	0	0	0
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking Maneuvers, N <sub>m</sub>												
Buses Stopping, N <sub>b</sub>	0	0		0	0		0	0		0	0	
Min. Time for Pedestrians, G <sub>p</sub>	3.2			3.2			3.2			3.2		
Phasing	EW Perm	WB Only	03	04		NS Perm	06		07		08	
Timing	G = 37.2	G = 7.0	G =	G =		G = 25.0	G =		G =		G =	
	Y = 4	Y = 4	Y =	Y =		Y = 4	Y =		Y =		Y =	
Duration of Analysis, T = 0.25							Cycle Length, C = 81.2					

Lane Group Capacity, Control Delay, and LOS Determination												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, v	26	1343		77	1832		198	219		9	14	
Lane Group Capacity, c	93	1648		338	2145		438	508		308	554	
v/c Ratio, X	0.28	0.81		0.23	0.85		0.45	0.43		0.03	0.03	
Total Green Ratio, g/C	0.46	0.46		0.59	0.59		0.31	0.31		0.31	0.31	
Uniform Delay, d <sub>1</sub>	13.7	19.0		23.3	13.6		22.6	22.4		19.6	19.6	
Progression Factor, PF	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Delay Calibration, k	0.11	0.36		0.11	0.39		0.11	0.11		0.11	0.11	
Incremental Delay, d <sub>2</sub>	1.6	3.3		0.3	3.6		0.7	0.6		0.0	0.0	
Initial Queue Delay, d <sub>3</sub>	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay	15.3	22.3		23.6	17.2		23.3	23.0		19.7	19.6	
Lane Group LOS	B	C		C	B		C	C		B	B	
Approach Delay	22.2			17.5			23.2			19.6		
Approach LOS	C			B			C			B		
Intersection Delay	19.9			X <sub>c</sub> = 0.72			Intersection LOS			B		

1/8/2006

## BACK-OF-QUEUE WORKSHEET

## General Information

Project Description Williams Field Road at Cooley Loop West PM Pk Hr-2025

## Average Back of Queue

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane Group	L	TR		L	TR		L	TR		L	TR	
Initial Queue/Lane	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Flow Rate/Lane Group	26	1343		77	1832		198	219		9	14	
Flow/Lane	204	1889		569	1897		1422	1649		1002	1798	
Capacity/Lane Group	93	1648		338	2145		438	508		308	554	
Flow Ratio	0.1	0.4		0.1	0.5		0.1	0.1		0.0	0.0	
Capacity Ratio	0.28	0.81		0.23	0.85		0.45	0.43		0.03	0.03	
Factor	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Arrival Type	3	3		3	3		3	3		3	3	
Platoon Ratio	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
FF Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
1	0.4	13.8		0.7	17.9		3.6	3.9		0.1	0.2	
2	0.2	0.6		0.3	0.7		0.4	0.4		0.3	0.5	
3	0.1	2.3		0.1	3.5		0.3	0.3		0.0	0.0	
Average	0.4	16.1		0.8	21.4		3.9	4.3		0.2	0.2	

## 95th Percentile Back of Queue (95th percentile)

1	2.1	1.7		2.1	1.7		2.0	2.0		2.1	2.1	
Back of Queue	0.9	28.1		1.7	36.0		7.8	8.4		0.3	0.5	

## Queue Storage Ratio

Queue Spacing	25.0	25.0		25.0	25.0		25.0	25.0		25.0	25.0	
Queue Storage	0	0		0	0		0	0		0	0	
Average Queue Storage Ratio												
95th % Queue Storage Ratio												

8/2006

## HCS+™ DETAILED REPORT

General Information		Site Information	
Analyst	MG	Intersection	Williams Field Rd at Recker Rd
Agency or Co.	TASK Eng	Area Type	All other areas
Date Performed	8/8/2006	Jurisdiction	Gilbert
Time Period		Analysis Year	
		Project ID	Williams Field Road at Recker Road AM Pk Hr-2025

Volume and Timing Input												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, N <sub>i</sub>	1	2	0	1	2	1	1	2	0	1	2	0
Lane Group	L	TR		L	T	R	L	TR		L	TR	
Volume, V (vph)	6	959	91	106	1131	94	78	865	191	89	817	78
Heavy Vehicles, %HV	0	0	0	0	0	0	0	0	0	0	0	0
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Pretimed (P) or Actuated (A)	A	A	A	A	A	A	A	A	A	A	A	A
Start-up Lost Time, l <sub>i</sub>	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Extension of Effective Green, e	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Arrival Type, AT	3	3		3	3	3	3	3		3	3	
Left Extension, UE	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Filtering/Metering, I	1.000	1.000		1.000	1.000	1.000	1.000	1.000		1.000	1.000	
Initial Unmet Demand, Q <sub>b</sub>	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Left / Bike / RTOR Volumes	0	0	10	0	0	10	0	0	10	0	0	10
Lane Width	12.0	12.0		12.0	12.0	12.0	12.0	12.0		12.0	12.0	
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking Maneuvers, N <sub>m</sub>												
Trucks Stopping, N <sub>s</sub>	0	0		0	0	0	0	0		0	0	
Min. Time for Pedestrians, G <sub>p</sub>	3.2			3.2			3.2			3.2		
Timing	EW Perm	WB Only	03	04	NS Perm	Excl. Left	07	08				
	G = 37.2	G = 3.0	G =	G =	G = 36.4	G = 5.4	G =	G =				
	Y = 4	Y = 0	Y =	Y =	Y = 4	Y = 0	Y =	Y =				
Duration of Analysis, T = 0.25							Cycle Length, C = 90.0					

Lane Group Capacity, Control Delay, and LOS Determination												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, v	7	1130		115	1229	91	85	1137		97	962	
Lane Group Capacity, c	84	1478		224	1777	793	286	1425		274	1446	
v/c Ratio, X	0.08	0.76		0.51	0.69	0.11	0.30	0.80		0.35	0.67	
Total Green Ratio, g/C	0.41	0.41		0.49	0.49	0.49	0.51	0.40		0.51	0.40	
Uniform Delay, d <sub>1</sub>	16.0	22.6		34.3	17.6	12.3	27.7	23.6		31.8	21.8	
Progression Factor, PF	1.000	1.000		1.000	1.000	1.000	1.000	1.000		1.000	1.000	
Delay Calibration, k	0.11	0.32		0.12	0.26	0.11	0.11	0.34		0.11	0.24	
Incremental Delay, d <sub>2</sub>	0.4	2.4		2.0	1.2	0.1	0.6	3.3		0.8	1.2	
Initial Queue Delay, d <sub>3</sub>	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay	16.5	25.1		36.3	18.8	12.4	28.3	26.9		32.6	23.0	
Lane Group LOS	B	C		D	B	B	C	C		C	C	
Approach Delay	25.0			19.8			27.0			23.9		
Approach LOS	C			B			C			C		
Intersection Delay	23.7			X <sub>c</sub> = 0.84			Intersection LOS			C		

1/8/2006

## BACK-OF-QUEUE WORKSHEET

## General Information

Project Description Williams Field Road at Recker Road AM Pk Hr-2025

## Average Back of Queue

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane Group	L	TR		L	T	R	L	TR		L	TR	
Initial Queue/Lane	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Flow Rate/Lane Group	7	1130		115	1229	91	85	1137		97	962	
Flow/Lane	204	1877		458	1900	1615	562	1850		537	1878	
Capacity/Lane Group	84	1478		224	1777	793	286	1425		274	1446	
Flow Ratio	0.0	0.3		0.3	0.3	0.1	0.2	0.3		0.2	0.3	
Capacity Ratio	0.08	0.76		0.51	0.69	0.11	0.30	0.80		0.35	0.67	
Factor	1.000	1.000		1.000	1.000	1.000	1.000	1.000		1.000	1.000	
Arrival Type	3	3		3	3	3	3	3		3	3	
Platoon Ratio	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Q1	0.1	12.7		1.5	12.4	1.2	1.1	13.1		1.2	10.3	
	0.2	0.6		0.3	0.7	0.6	0.3	0.6		0.3	0.6	
Q2	0.0	1.8		0.3	1.4	0.1	0.1	2.1		0.2	1.1	
Average	0.1	14.5		1.8	13.8	1.3	1.2	15.2		1.4	11.4	

## Percentile Back of Queue (95th percentile)

	2.1	1.8		2.0	1.8	2.1	2.1	1.8		2.1	1.8	
Back of Queue	0.3	25.6		3.7	24.6	2.7	2.5	26.7		2.9	20.7	

## Queue Storage Ratio

Queue Spacing	25.0	25.0		25.0	25.0	25.0	25.0	25.0		25.0	25.0	
Queue Storage	0	0		0	0	0	0	0		0	0	
Average Queue Storage Ratio												
% Queue Storage Ratio												

3/2006

## HCS+™ DETAILED REPORT

## General Information

Analyst MG  
 Agency or Co. TASK Eng  
 Date Performed 8/8/2006  
 Time Period

## Site Information

Intersection Williams Field Rd at Recker Rd  
 Area Type All other areas  
 Jurisdiction Gilbert  
 Analysis Year  
 Project ID Williams Field Road at Recker Road  
 PM Pk Hr-2025

## Volume and Timing Input

Time and Timing Input				EB			WB			NB			SB		
				LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, N <sub>i</sub>				1	2	0	1	2	1	1	2	0	1	2	0
Lane Group				L	TR		L	T	R	L	TR		L	TR	
Volume, V (vph)				21	1384	111	185	1600	376	67	791	123	124	1158	
Heavy Vehicles, %HV				0	0	0	0	0	0	0	0	0	0	0	
Peak-Hour Factor, PHF				0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Pretimed (P) or Actuated (A)				A	A	A	A	A	A	A	A	A	A	A	
Start-up Lost Time, l <sub>i</sub>				2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Extension of Effective Green, e				2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Arrival Type, AT				3	3		3	3	3	3	3		3	3	
Left Extension, UE				3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Filtering/Metering, I				1.000	1.000		1.000	1.000	1.000	1.000	1.000		1.000	1.000	
Initial Unmet Demand, Q <sub>b</sub>				0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Left / Bike / RTOR Volumes				0	0	60	0	0	80	0	0	40	0	0	10
Lane Width				12.0	12.0		12.0	12.0	12.0	12.0	12.0		12.0	12.0	
Parking / Grade / Parking				N	0	N	N	0	N	N	0	N	N	0	N
Parking Maneuvers, N <sub>m</sub>															
Buses Stopping, N <sub>b</sub>				0	0		0	0	0	0	0		0	0	
Min. Time for Pedestrians, G <sub>p</sub>				3.2			3.2			3.2			3.2		
Timing		EW Perm	WB Only	03		04		NS Perm		Excl. Left		07		08	
Timing		G = 38.6	G = 5.0	G =		G =		G = 33.3		G = 5.1		G =		G =	
		Y = 4	Y = 0	Y =		Y =		Y = 4		Y = 0		Y =		Y =	
Duration of Analysis, T = 0.25												Cycle Length, C = 90.0			

## Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, v	23	1559		201	1739	322	73	950		135	1321	
Lane Group Capacity, c	84	1543		265	1914	854	267	1319		267	1329	
v/c Ratio, X	0.27	1.01		0.76	0.91	0.38	0.27	0.72		0.51	0.99	
Total Green Ratio, g/C	0.43	0.43		0.53	0.53	0.53	0.47	0.37		0.47	0.37	
Uniform Delay, d <sub>1</sub>	16.6	25.7		36.9	19.2	12.5	34.2	24.3		33.0	28.3	
Progression Factor, PF	1.000	1.000		1.000	1.000	1.000	1.000	1.000		1.000	1.000	
Delay Calibration, k	0.11	0.50		0.31	0.43	0.11	0.11	0.28		0.11	0.50	
Incremental Delay, d <sub>2</sub>	1.8	25.5		12.0	6.9	0.3	0.6	1.9		1.6	23.2	
Initial Queue Delay, d <sub>3</sub>	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay	18.4	51.2		48.9	26.1	12.8	34.7	26.3		34.6	51.4	
Lane Group LOS	B	D		D	C	B	C	C		C	D	
Approach Delay	50.7			26.2			26.9			49.9		
Approach LOS	D			C			C			D		
Intersection Delay	37.9			X <sub>c</sub> = 0.94			Intersection LOS			D		



11/8/2006

## BACK-OF-QUEUE WORKSHEET

## General Information

Project Description Williams Field Road at Recker Road PM Pk Hr-2025

## Average Back of Queue

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane Group	L	TR		L	T	R	L	TR		L	TR	
Initial Queue/Lane	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Flow Rate/Lane Group	23	1559		201	1739	322	73	950		135	1321	
Offflow/Lane	197	1889		501	1900	1615	566	1872		566	1886	
Capacity/Lane Group	84	1543		265	1914	854	267	1319		267	1329	
Flow Ratio	0.1	0.4		0.4	0.5	0.2	0.1	0.3		0.2	0.4	
Ratio	0.27	1.01		0.76	0.91	0.38	0.27	0.72		0.51	0.99	
Factor	1.000	1.000		1.000	1.000	1.000	1.000	1.000		1.000	1.000	
Arrival Type	3	3		3	3	3	3	3		3	3	
Platoon Ratio	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
	0.4	20.4		2.6	20.7	4.7	1.0	10.7		1.9	17.3	
	0.2	0.6		0.3	0.7	0.6	0.3	0.6		0.3	0.6	
	0.1	8.4		0.9	4.8	0.4	0.1	1.3		0.3	6.6	
Average	0.4	28.9		3.4	25.5	5.1	1.1	12.0		2.2	23.9	

## Percentile Back of Queue (95th percentile)

	2.1	1.6		2.0	1.6	2.0	2.1	1.8		2.0	1.7	
Back of Queue	0.9	46.8		6.9	42.0	10.0	2.3	21.8		4.5	39.6	

## Queue Storage Ratio

Queue Spacing	25.0	25.0		25.0	25.0	25.0	25.0	25.0		25.0	25.0	
Queue Storage	0	0		0	0	0	0	0		0	0	
Queue Storage Ratio												
% Queue Storage Ratio												

11/8/2006

## HCS+ DETAILED REPORT

## General Information

Analyst MG  
 Agency or Co. TASK Eng  
 Date Performed 8/8/2006  
 Time Period

## Site Information

Intersection W. Field Rd/Cooley Loop East  
 Area Type All other areas  
 Jurisdiction Gilbert  
 Analysis Year  
 Project ID Williams Field Road at Cooley Loop  
 East AM Pk Hr-2025

## Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, N <sub>l</sub>	1	2	0	1	2	0	1	1	0	1	1	
Lane Group	L	TR		L	TR		L	TR		L	TR	
Volume, V (vph)	41	1088	11	61	780	34	156	25	180	93	35	
% Heavy Vehicles, %HV	0	0	0	0	0	0	0	0	0	0	0	
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Pretimed (P) or Actuated (A)	A	A	A	A	A	A	A	A	A	A	A	
Start-up Lost Time, I <sub>l</sub>	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Extension of Effective Green, e	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Arrival Type, AT	3	3		3	3		3	3		3	3	
Unit Extension, UE	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Filtering/Metering, I	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Initial Unmet Demand, Q <sub>b</sub>	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Ped / Bike / RTOR Volumes	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking Maneuvers, N <sub>m</sub>												
Buses Stopping, N <sub>b</sub>	0	0		0	0		0	0		0	0	
Min. Time for Pedestrians, G <sub>p</sub>	3.2			3.2			3.2			3.2		
Phasing	EW Perm	WB Only	03	04	NS Perm	06	07	08				
Timing	G = 35.0	G = 5.0	G =	G =	G = 20.0	G =	G =	G =				
	Y =	Y =	Y =	Y =	Y =	Y =	Y =	Y =				
Duration of Analysis, T = 0.25						Cycle Length, C = 60.0						

## Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, v	45	1195		66	885		170	223		101	198	
Lane Group Capacity, c	286	2107		312	2397		302	550		281	557	
v/c Ratio, X	0.16	0.57		0.21	0.37		0.56	0.41		0.36	0.36	
Total Green Ratio, g/C	0.58	0.58		0.67	0.67		0.33	0.33		0.33	0.33	
Uniform Delay, d <sub>1</sub>	5.7	7.8		10.9	4.4		16.4	15.4		15.1	15.1	
Progression Factor, PF	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Delay Calibration, k	0.11	0.16		0.11	0.11		0.16	0.11		0.11	0.11	
Incremental Delay, d <sub>2</sub>	0.3	0.4		0.3	0.1		2.4	0.5		0.8	0.4	
Initial Queue Delay, d <sub>3</sub>	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay	6.0	8.1		11.2	4.5		18.8	15.9		15.9	15.5	
Lane Group LOS	A	A		B	A		B	B		B	B	
Approach Delay	8.1			5.0			17.2			15.7		
Approach LOS	A			A			B			B		
Intersection Delay	9.1			X <sub>c</sub> = 0.52			Intersection LOS			A		

11/8/2006

# BACK-OF-QUEUE WORKSHEET

## General Information

Project Description Williams Field Road at Cooley Loop East AM Pk Hr-2025

## Average Back of Queue

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane Group	L	TR		L	TR		L	TR		L	TR	
Initial Queue/Lane	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Flow Rate/Lane Group	45	1195		66	885		170	223		101	198	
Flow/Lane	490	1897		469	1888		906	1650		844	1670	
Capacity/Lane Group	286	2107		312	2397		302	550		281	557	
Flow Ratio	0.1	0.3		0.1	0.2		0.2	0.1		0.1	0.1	
Ratio	0.16	0.57		0.21	0.37		0.56	0.41		0.36	0.36	
Factor	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Signal Type	3	3		3	3		3	3		3	3	
Platoon Ratio	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
	0.3	6.5		0.4	3.4		2.3	2.9		1.3	2.5	
	0.3	0.6		0.3	0.6		0.3	0.4		0.3	0.4	
	0.0	0.7		0.1	0.4		0.3	0.3		0.1	0.2	
Average	0.4	7.2		0.4	3.8		2.7	3.1		1.4	2.7	

## Percentile Back of Queue (95th percentile)

	2.1	1.9		2.1	2.0		2.0	2.0		2.1	2.0	
% of Queue	0.8	13.8		0.9	7.5		5.4	6.3		2.9	5.5	

## Queue Storage Ratio

Queue Spacing	25.0	25.0		25.0	25.0		25.0	25.0		25.0	25.0	
Queue Storage	0	0		0	0		0	0		0	0	
Queue Storage Ratio												
% Queue Storage Ratio												

8/2006

## HCS+™ DETAILED REPORT

## General Information

Analyst MG  
 Agency or Co. TASK Eng  
 Date Performed 8/8/2006  
 Time Period

## Site Information

Intersection W. Field Rd/Cooley Loop East  
 Area Type All other areas  
 Jurisdiction Gilbert  
 Analysis Year  
 Project ID Williams Field Road at Cooley Loop  
 East PM Pk Hr-2025

## Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, $N_i$	1	2	0	1	2	0	1	1	0	1	1	
Lane Group	L	TR		L	TR		L	TR		L	TR	
Volume, $V$ (vph)	62	1248	68	150	1876	173	94	25	144	80	80	
Heavy Vehicles, %HV	0	0	0	0	0	0	0	0	0	0	0	
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Pretimed (P) or Actuated (A)	A	A	A	A	A	A	A	A	A	A	A	
Start-up Lost Time, $l_i$	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Extension of Effective Green, $e$	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Arrival Type, AT	3	3		3	3		3	3		3	3	
Split Extension, UE	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Filtering/Metering, $f_i$	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Initial Unmet Demand, $Q_b$	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Lead / Bike / RTOR Volumes	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking Maneuvers, $N_m$												
Trucks Stopping, $N_s$	0	0		0	0		0	0		0	0	
Min. Time for Pedestrians, $G_p$	3.2			3.2			3.2			3.2		

Timing	EW Perm	WB Only	03	04	NS Perm	06	07	08
	G = 35.0	G = 5.0	G =	G =	G = 20.0	G =	G =	G =
	Y =	Y =	Y =	Y =	Y =	Y =	Y =	Y =

Duration of Analysis,  $T = 0.25$ Cycle Length,  $C = 60.0$ 

## Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, $v$	67	1431		163	2227		102	184		87	167	
Lane Group Capacity, $c$	127	2094		277	2381		328	552		314	588	
$v/c$ Ratio, $X$	0.53	0.68		0.59	0.94		0.31	0.33		0.28	0.28	
Total Green Ratio, $g/C$	0.58	0.58		0.67	0.67		0.33	0.33		0.33	0.33	
Uniform Delay, $d_1$	7.5	8.7		18.6	8.9		14.9	15.0		14.7	14.7	
Progression Factor, PF	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Delay Calibration, $k$	0.13	0.25		0.18	0.45		0.11	0.11		0.11	0.11	
Incremental Delay, $d_2$	4.1	0.9		3.3	7.8		0.5	0.4		0.5	0.3	
Initial Queue Delay, $d_3$	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay	11.6	9.6		21.9	16.6		15.4	15.4		15.2	15.0	
Lane Group LOS	B	A		C	B		B	B		B	B	
Approach Delay	9.7			17.0			15.4			15.1		
Approach LOS	A			B			B			B		
Intersection Delay	14.3			$X_c = 0.73$			Intersection LOS			B		

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# BACK-OF-QUEUE WORKSHEET

## General Information

Project Description Williams Field Road at Cooley Loop East PM Pk Hr-2025

## Average Back of Queue

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Line Group	L	TR		L	TR		L	TR		L	TR	
Initial Queue/Lane	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Flow Rate/Lane Group	67	1431		163	2227		102	184		87	167	
Outflow/Lane	217	1885		416	1876		985	1657		941	1763	
Capacity/Lane Group	127	2094		277	2381		328	552		314	588	
Flow Ratio	0.3	0.4		0.4	0.6		0.1	0.1		0.1	0.1	
Ratio	0.53	0.68		0.59	0.94		0.31	0.33		0.28	0.28	
Factor	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Arrival Type	3	3		3	3		3	3		3	3	
Platoon Ratio	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
RT	0.7	8.7		1.0	17.2		1.3	2.3		1.1	2.0	
	0.2	0.6		0.3	0.6		0.3	0.4		0.3	0.4	
	0.2	1.2		0.3	5.7		0.1	0.2		0.1	0.2	
Average	0.8	9.9		1.3	23.0		1.4	2.5		1.2	2.2	

## Percentile Back of Queue (95th percentile)

	2.1	1.8		2.1	1.7		2.1	2.0		2.1	2.0	
Back of Queue	1.7	18.2		2.7	38.3		2.9	5.0		2.4	4.5	

## Queue Storage Ratio

Queue Spacing	25.0	25.0		25.0	25.0		25.0	25.0		25.0	25.0	
Queue Storage	0	0		0	0		0	0		0	0	
Average Queue Storage Ratio												
95% Queue Storage Ratio												

1/8/2006

## HCS+™ DETAILED REPORT

General Information				Site Information			
Analyst	MG	Intersection	Williams Field Rd at Access 2	Area Type	All other areas	Jurisdiction	Gilbert
Agency or Co.	TASK Eng	Analysis Year		Project ID	Williams Field Road at Access 2 AM		
Site Performed	8/8/2006				Pk Hr-2025		
Time Period							

Volume and Timing Input												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, N <sub>i</sub>		2	0	1	2		1		1			
Lane Group		TR		L	T		L		R			
Volume, V (vph)		1220	108	31	803		78		12			
Heavy Vehicles, %HV		0	0	0	0		0		0			
Peak-Hour Factor, PHF		0.92	0.92	0.92	0.92		0.92		0.92			
Pretimed (P) or Actuated (A)		A	A	A	A		A		A			
Start-up Lost Time, l <sub>i</sub>		2.0		2.0	2.0		2.0		2.0			
Extension of Effective Green, e		2.0		2.0	2.0		2.0		2.0			
Arrival Type, AT		3		3	3		3		3			
Unit Extension, UE		3.0		3.0	3.0		3.0		3.0			
Filtering/Metering, I		1.000		1.000	1.000		1.000		1.000			
Initial Unmet Demand, Q <sub>b</sub>		0.0		0.0	0.0		0.0		0.0			
Left / Bike / RTOR Volumes	0	0	0	0	0		0	0	0			
Lane Width		12.0		12.0	12.0		12.0		12.0			
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N			
Parking Maneuvers, N <sub>m</sub>												
Buses Stopping, N <sub>b</sub>		0		0	0		0		0			
Min. Time for Pedestrians, G <sub>p</sub>		3.2		3.2	3.2		3.2		3.2			
Phasing	EW Perm	02	03	04		NB Only	06	07	08			
Timing	G = 35.0	G =	G =	G =		G = 20.0	G =	G =	G =			
	Y =	Y =	Y =	Y =		Y =	Y =	Y =	Y =			
Duration of Analysis, T = 0.25												

Lane Group Capacity, Control Delay, and LOS Determination												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, v		1443		34	873		85		13			
Lane Group Capacity, c		2274		138	2302		656		587			
v/c Ratio, X		0.63		0.25	0.38		0.13		0.02			
Total Green Ratio, g/C		0.64		0.64	0.64		0.36		0.36			
Uniform Delay, d <sub>1</sub>		6.1		4.3	4.8		11.7		11.2			
Progression Factor, PF		1.000		1.000	1.000		1.000		1.000			
Delay Calibration, k		0.21		0.11	0.11		0.11		0.11			
Incremental Delay, d <sub>2</sub>		0.6		0.9	0.1		0.1		0.0			
Initial Queue Delay, d <sub>3</sub>		0.0		0.0	0.0		0.0		0.0			
Control Delay		6.7		5.2	4.9		11.8		11.2			
Lane Group LOS		A		A	A		B		B			
Approach Delay		6.7		4.9			11.7					
Approach LOS		A		A			B					
Intersection Delay		6.2		X <sub>c</sub> = 0.45			Intersection LOS				A	

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## BACK-OF-QUEUE WORKSHEET

## General Information

Project Description Williams Field Road at Access 2 AM Pk Hr-2025

## Average Back of Queue

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Group		TR		L	T		L		R			
Queue/Lane		0.0		0.0	0.0		0.0		0.0			
Volume/Lane Group		1443		34	873		85		13			
Flow/Lane		1877		217	1900		1805		1615			
Capacity/Lane Group		2274		138	2302		656		587			
Flow Ratio		0.4		0.2	0.2		0.0		0.0			
Ratio		0.63		0.25	0.38		0.13		0.02			
Factor		1.000		1.000	1.000		1.000		1.000			
Value Type		3		3	3		3		3			
Station Ratio		1.00		1.00	1.00		1.00		1.00			
Factor		1.00		1.00	1.00		1.00		1.00			
		7.0		0.2	3.4		0.9		0.1			
		0.6		0.2	0.6		0.4		0.4			
		1.0		0.1	0.3		0.1		0.0			
Average		8.0		0.3	3.7		0.9		0.1			

## Percentile Back of Queue (95th percentile)

		1.9		2.1	2.0		2.1		2.1			
Back of Queue		15.1		0.6	7.4		1.9		0.3			

## Queue Storage Ratio

Queue Spacing		25.0		25.0	25.0		25.0		25.0			
Queue Storage		0		0	0		0		0			
Average Queue Storage Ratio												
% Queue Storage Ratio												

11/8/2006

## HCS+ DETAILED REPORT

## General Information

Analyst MG  
 Agency or Co. TASK Eng  
 Date Performed 8/8/2006  
 Time Period

## Site Information

Intersection Williams Field Rd at Access 2  
 Area Type All other areas  
 Jurisdiction Gilbert  
 Analysis Year  
 Project ID Williams Field Road at Access 2 PM  
 Pk Hr-2025

## Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, N <sub>i</sub>		2	0	1	2		1		1			
Lane Group		TR		L	T		L		R			
Volume, V (vph)		1143	329	100	1870		428		76			
% Heavy Vehicles, %HV		0	0	0	0		0		0			
Peak-Hour Factor, PHF		0.92	0.92	0.92	0.92		0.92		0.92			
Pretimed (P) or Actuated (A)		A	A	A	A		A		A			
Start-up Lost Time, l <sub>i</sub>		2.0		2.0	2.0		2.0		2.0			
Extension of Effective Green, e		2.0		2.0	2.0		2.0		2.0			
Arrival Type, AT		3		3	3		3		3			
Unit Extension, UE		3.0		3.0	3.0		3.0		3.0			
Filtering/Metering, I		1.000		1.000	1.000		1.000		1.000			
Initial Unmet Demand, Q <sub>b</sub>		0.0		0.0	0.0		0.0		0.0			
Ped / Bike / RTOR Volumes	0	0	0	0	0		0	0	0			
Lane Width		12.0		12.0	12.0		12.0		12.0			
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N			
Parking Maneuvers, N <sub>m</sub>												
Buses Stopping, N <sub>b</sub>		0		0	0		0		0			
Min. Time for Pedestrians, G <sub>p</sub>		3.2		3.2			3.2					

Phasing	EW Perm	02	03	04	NB Only	06	07	08
Timing	G = 35.0	G =	G =	G =	G = 20.0	G =	G =	G =
	Y =	Y =	Y =	Y =	Y =	Y =	Y =	Y =
Duration of Analysis, T = 0.25				Cycle Length, C = 55.0				

## Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB	
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH
Adjusted Flow Rate, v		1600		109	2033		465		83		
Lane Group Capacity, c		2225		138	2302		656		587		
v/c Ratio, X		0.72		0.79	0.88		0.71		0.14		
Total Green Ratio, g/C		0.64		0.64	0.64		0.36		0.36		
Uniform Delay, d <sub>1</sub>		6.7		7.3	8.3		15.0		11.7		
Progression Factor, PF		1.000		1.000	1.000		1.000		1.000		
Delay Calibration, k		0.28		0.34	0.41		0.27		0.11		
Incremental Delay, d <sub>2</sub>		1.2		25.9	4.5		3.5		0.1		
Initial Queue Delay, d <sub>3</sub>		0.0		0.0	0.0		0.0		0.0		
Control Delay		7.9		33.2	12.8		18.6		11.9		
Lane Group LOS		A		C	B		B		B		
Approach Delay	7.9			13.8			17.5				
Approach LOS	A			B			B				
Intersection Delay	12.1			X <sub>c</sub> = 0.82			Intersection LOS			B	



11/8/2006

## BACK-OF-QUEUE WORKSHEET

## General Information

Project Description Williams Field Road at Access 2 PM Pk Hr-2025

## Average Back of Queue

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane Group		TR		L	T		L		R			
Initial Queue/Lane		0.0		0.0	0.0		0.0		0.0			
Flow Rate/Lane Group		1600		109	2033		465		83			
Outflow/Lane		1836		217	1900		1805		1615			
Capacity/Lane Group		2225		138	2302		656		587			
Flow Ratio		0.5		0.5	0.6		0.3		0.1			
Capacity Ratio		0.72		0.79	0.88		0.71		0.14			
Factor		1.000		1.000	1.000		1.000		1.000			
Arrival Type		3		3	3		3		3			
Platoon Ratio		1.00		1.00	1.00		1.00		1.00			
F Factor		1.00		1.00	1.00		1.00		1.00			
		8.6		1.2	13.5		6.1		0.9			
		0.6		0.2	0.6		0.4		0.4			
Q2		1.4		0.5	3.6		0.9		0.1			
Average		10.0		1.7	17.1		7.0		0.9			

## Percentile Back of Queue (95th percentile)

		1.8		2.0	1.7		1.9		2.1			
Back of Queue		18.4		3.5	29.6		13.4		1.9			

## Queue Storage Ratio

Queue Spacing		25.0		25.0	25.0		25.0		25.0			
Queue Storage		0		0	0		0		0			
Average Queue Storage Ratio												
% Queue Storage Ratio												

11/8/2006

## HCS+™ DETAILED REPORT

General Information					Site Information		
Analyst	MG				Intersection	Williams Field Rd at Access 1	
Agency or Co.	TASK Eng				Area Type	All other areas	
Date Performed	8/8/2006				Jurisdiction	Gilbert	
Time Period					Analysis Year		
					Project ID	Williams Field Road at Access 1 AM Pk Hr-2025	

Volume and Timing Input												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, N <sub>i</sub>	1	2	0	1	2	0	1	1	0	1	1	
Lane Group	L	TR		L	TR		L	TR		L	TR	
Volume, V (vph)	111	1121	5	5	750	3	5	5	5	2	3	
% Heavy Vehicles, %HV	0	0	0	0	0	0	0	0	0	0	0	
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Pretimed (P) or Actuated (A)	A	A	A	A	A	A	A	A	A	A	A	
Start-up Lost Time, l <sub>i</sub>	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Extension of Effective Green, e	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Arrival Type, AT	3	3		3	3		3	3		3	3	
Unit Extension, UE	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Filtering/Metering, I	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Initial Unmet Demand, Q <sub>b</sub>	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Ped / Bike / RTOR Volumes	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking Maneuvers, N <sub>m</sub>												
Buses Stopping, N <sub>b</sub>	0	0		0	0		0	0		0	0	
Min. Time for Pedestrians, G <sub>p</sub>	3.2			3.2			3.2			3.2		
Phasing	EW Perm	EB Only	03	04		NS Perm	06		07		08	
Timing	G = 25.0	G = 10.0	G =	G =		G = 20.0	G =		G =		G =	
	Y =	Y =	Y =	Y =		Y =	Y =		Y =		Y =	
Duration of Analysis, T = 0.25							Cycle Length, C = 55.0					

Lane Group Capacity, Control Delay, and LOS Determination												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, v	121	1223		5	818		5	10		2	93	
Lane Group Capacity, c	513	1643		138	1644		436	639		514	591	
v/c Ratio, X	0.24	0.74		0.04	0.50		0.01	0.02		0.00	0.16	
Total Green Ratio, g/C	0.64	0.45		0.45	0.45		0.36	0.36		0.36	0.36	
Uniform Delay, d <sub>1</sub>	9.7	12.4		8.3	10.6		11.2	11.2		11.2	11.8	
Progression Factor, PF	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Delay Calibration, k	0.11	0.30		0.11	0.11		0.11	0.11		0.11	0.11	
Incremental Delay, d <sub>2</sub>	0.2	1.9		0.1	0.2		0.0	0.0		0.0	0.1	
Initial Queue Delay, d <sub>3</sub>	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay	9.9	14.3		8.4	10.8		11.2	11.2		11.2	11.9	
Lane Group LOS	A	B		A	B		B	B		B	B	
Approach Delay	13.9			10.8			11.2			11.9		
Approach LOS	B			B			B			B		
Intersection Delay	12.7			X <sub>c</sub> = 0.40			Intersection LOS			B		

11/8/2006

## BACK-OF-QUEUE WORKSHEET

## General Information

Project Description Williams Field Road at Access 1 AM Pk Hr-2025

## Average Back of Queue

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane Group	L	TR		L	TR		L	TR		L	TR	
Initial Queue/Lane	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Flow Rate/Lane Group	121	1223		5	818		5	10		2	93	
Flow/Lane	806	1898		304	1899		1198	1758		1413	1624	
Capacity/Lane Group	513	1643		138	1644		436	639		514	591	
Flow Ratio	0.2	0.3		0.0	0.2		0.0	0.0		0.0	0.1	
Capacity Ratio	0.24	0.74		0.04	0.50		0.01	0.02		0.00	0.16	
Factor	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Arrival Type	3	3		3	3		3	3		3	3	
Platoon Ratio	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
1	0.7	8.1		0.0	4.6		0.0	0.1		0.0	1.0	
	0.3	0.5		0.2	0.5		0.3	0.4		0.3	0.4	
2	0.1	1.3		0.0	0.5		0.0	0.0		0.0	0.1	
Average	0.8	9.4		0.0	5.1		0.1	0.1		0.0	1.0	

## Percentile Back of Queue (95th percentile)

1%	2.1	1.9		2.1	2.0		2.1	2.1		2.1	2.1	
Back of Queue	1.7	17.4		0.1	9.9		0.1	0.2		0.0	2.1	

## Queue Storage Ratio

Queue Spacing	25.0	25.0		25.0	25.0		25.0	25.0		25.0	25.0	
Queue Storage	0	0		0	0		0	0		0	0	
Average Queue Storage Ratio												
95% Queue Storage Ratio												

8/2006

## HCS+™ DETAILED REPORT

General Information		Site Information	
Analyst	MG	Intersection	Williams Field Rd at Access 1
Agency or Co.	TASK Eng	Area Type	All other areas
Date Performed	8/8/2006	Jurisdiction	Gilbert
Time Period		Analysis Year	
		Project ID	Williams Field Road at Access 1 PM Pk Hr-2025

Volume and Timing Input												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, $N_L$	1	2	0	1	2	0	1	1	0	1	1	0
Lane Group	L	TR		L	TR		L	TR		L	TR	
Volume, $V$ (vph)	370	849	5	5	1517	8	5	5	5	8	37	5
Heavy Vehicles, %HV	0	0	0	0	0	0	0	0	0	0	0	0
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Pretimed (P) or Actuated (A)	A	A	A	A	A	A	A	A	A	A	A	A
Start-up Lost Time, $l_i$	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Extension of Effective Green, $e$	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Arrival Type, AT	3	3		3	3		3	3		3	3	
Split Extension, UE	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Metering/Metering, $l$	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Initial Unmet Demand, $Q_b$	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Lead / Bike / RTOR Volumes	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking Maneuvers, $N_m$												
Trucks Stopping, $N_b$	0	0		0	0		0	0		0	0	
Min. Time for Pedestrians, $G_p$	3.2			3.2			3.2			3.2		
Timing	EW Perm	EB Only	03	04		NS Perm	06		07		08	
Timing	G = 25.0	G = 10.0	G =	G =		G = 20.0	G =		G =		G =	
	Y =	Y =	Y =	Y =		Y =	Y =		Y =		Y =	
Duration of Analysis, $T = 0.25$								Cycle Length, $C = 55.0$				

Lane Group Capacity, Control Delay, and LOS Determination												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, $v$	402	928		5	1658		5	10		9	532	
Lane Group Capacity, $c$	466	1643		148	1643		138	639		514	595	
Flow Ratio, $X$	0.86	0.56		0.03	1.01		0.04	0.02		0.02	0.89	
Total Green Ratio, $g/C$	0.64	0.45		0.45	0.45		0.36	0.36		0.36	0.36	
Uniform Delay, $d_1$	19.5	11.0		8.3	15.0		11.3	11.2		11.2	16.5	
Progression Factor, PF	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Delay Calibration, $k$	0.39	0.16		0.11	0.50		0.11	0.11		0.11	0.42	
Incremental Delay, $d_2$	15.3	0.5		0.1	24.5		0.1	0.0		0.0	16.0	
Initial Queue Delay, $d_3$	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay	34.8	11.5		8.4	39.5		11.4	11.2		11.2	32.5	
Lane Group LOS	C	B		A	D		B	B		B	C	
Approach Delay	18.5			39.4			11.3			32.1		
Approach LOS	B			D			B			C		
Intersection Delay	30.3			$X_c = 0.93$			Intersection LOS			C		

11/8/2006

## BACK-OF-QUEUE WORKSHEET

## General Information

Project Description Williams Field Road at Access 1 PM Pk Hr-2025

## Average Back of Queue

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane Group	L	TR		L	TR		L	TR		L	TR	
Initial Queue/Lane	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Flow Rate/Lane Group	402	928		5	1658		5	10		9	532	
Outflow/Lane	733	1898		325	1898		380	1758		1413	1636	
Capacity/Lane Group	466	1643		148	1643		138	639		514	595	
Flow Ratio	0.5	0.3		0.0	0.5		0.0	0.0		0.0	0.3	
v/c Ratio	0.86	0.56		0.03	1.01		0.04	0.02		0.02	0.89	
Factor	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Arrival Type	3	3		3	3		3	3		3	3	
Platoon Ratio	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
PF Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
	2.6	5.5		0.0	13.3		0.0	0.1		0.1	7.7	
	0.3	0.5		0.2	0.5		0.2	0.4		0.3	0.4	
	1.7	0.6		0.0	7.7		0.0	0.0		0.0	2.4	
Average	4.3	6.1		0.0	21.0		0.1	0.1		0.1	10.1	

## Percentile Back of Queue (95th percentile)

	2.0	1.9		2.1	1.7		2.1	2.1		2.1	1.8	
Back of Queue	8.5	11.7		0.1	35.4		0.1	0.2		0.2	18.6	

## Queue Storage Ratio

Queue Spacing	25.0	25.0		25.0	25.0		25.0	25.0		25.0	25.0	
Queue Storage	0	0		0	0		0	0		0	0	
Average Queue Storage Ratio												
% Queue Storage Ratio												

1/8/2006

## HCS+™ DETAILED REPORT

## General Information

Analyst MG  
 Agency or Co. TASK Eng  
 Date Performed 8/8/2006  
 Time Period

## Site Information

Intersection William Field Rd at Power Road  
 Area Type All other areas  
 Jurisdiction Gilbert  
 Analysis Year  
 Project ID Williams Field Road at Power Road  
 AM Pk Hr-2025

## Volume and Timing Input

			EB			WB			NB			SB								
			LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT						
Number of Lanes, N <sub>i</sub>			1	3	0	1	3	0	1	3	0	1	3	0						
Lane Group			L	TR		L	TR		L	TR		L	TR							
Volume, V (vph)			336	258	476	10	111	1	267	724	46	2	315	2						
% Heavy Vehicles, %HV			0	0	0	0	0	0	0	0	0	0	0	0						
Peak-Hour Factor, PHF			0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92						
Pretimed (P) or Actuated (A)			A	A	A	A	A	A	A	A	A	A	A	A						
Start-up Lost Time, l <sub>i</sub>			2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0							
Extension of Effective Green, e			2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0							
Arrival Type, AT			3	3		3	3		3	3		3	3							
Unit Extension, UE			3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0							
Filtering/Metering, I			1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000							
Initial Unmet Demand, Q <sub>b</sub>			0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0							
Ped / Bike / RTOR Volumes			0	0	60	0	0	0	0	0	40	0	0	10						
Lane Width			12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0							
Parking / Grade / Parking			N	0	N	N	0	N	N	0	N	N	0	N						
Parking Maneuvers, N <sub>m</sub>																				
Buses Stopping, N <sub>b</sub>			0	0		0	0		0	0		0	0							
Min. Time for Pedestrians, G <sub>p</sub>			3.2			3.2			3.2			3.2								
Phasing	EW Perm	WB Only	03			04			NS Perm			NB Only			07			08		
Timing	G = 37.2	G = 3.0	G =			G =			G = 25.0			G = 10.4			G =			G =		
	Y = 4	Y = 0	Y =			Y =			Y = 4			Y = 0			Y =			Y =		
Duration of Analysis, T = 0.25										Cycle Length, C = 83.6										

## Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, v	365	732		11	122		290	794		2	655	
Lane Group Capacity, c	567	2090		390	2733		453	1546		136	1437	
v/c Ratio, X	0.64	0.35		0.03	0.04		0.64	0.51		0.01	0.46	
Total Green Ratio, g/C	0.44	0.44		0.53	0.53		0.47	0.30		0.30	0.30	
Uniform Delay, d <sub>1</sub>	18.0	15.3		13.7	9.5		25.7	24.3		20.6	23.8	
Progression Factor, PF	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Delay Calibration, k	0.22	0.11		0.11	0.11		0.22	0.12		0.11	0.11	
Incremental Delay, d <sub>2</sub>	2.5	0.1		0.0	0.0		3.0	0.3		0.0	0.2	
Initial Queue Delay, d <sub>3</sub>	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay	20.6	15.4		13.8	9.5		28.7	24.6		20.7	24.0	
Lane Group LOS	C	B		B	A		C	C		C	C	
Approach Delay	17.1			9.9			25.7			24.0		
Approach LOS	B			A			C			C		
Intersection Delay	21.4			X <sub>c</sub> = 0.70			Intersection LOS			C		

11/8/2006

## BACK-OF-QUEUE WORKSHEET

## General Information

Project Description Williams Field Road at Power Road AM Pk Hr-2025

## Average Back of Queue

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane Group	L	TR		L	TR		L	TR		L	TR	
Initial Queue/Lane	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Flow Rate/Lane Group	365	732		11	122		290	794		2	655	
Satflow/Lane	1275	1723		737	1897		960	1897		455	1763	
Capacity/Lane Group	567	2090		390	2733		453	1546		136	1437	
Flow Ratio	0.3	0.2		0.0	0.0		0.3	0.2		0.0	0.1	
v/c Ratio	0.64	0.35		0.03	0.04		0.64	0.51		0.01	0.46	
Factor	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Arrival Type	3	3		3	3		3	3		3	3	
Platoon Ratio	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
PF Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
1	6.6	4.1		0.1	0.5		4.0	5.6		0.0	4.5	
2	0.5	0.6		0.4	0.7		0.4	0.5		0.2	0.4	
3	0.8	0.3		0.0	0.0		0.7	0.5		0.0	0.4	
Average	7.4	4.4		0.1	0.5		4.7	6.1		0.0	4.9	

## Percentile Back of Queue (95th percentile)

1	1.9	2.0		2.1	2.1		2.0	1.9		2.1	2.0	
Back of Queue	14.1	8.7		0.3	1.1		9.2	11.7		0.1	9.6	

## Queue Storage Ratio

Queue Spacing	25.0	25.0		25.0	25.0		25.0	25.0		25.0	25.0	
Queue Storage	0	0		0	0		0	0		0	0	
Average Queue Storage Ratio												
% Queue Storage Ratio												

11/8/2006

## HCS+™ DETAILED REPORT

## General Information

Analyst MG  
 Agency or Co. TASK Eng  
 Date Performed 8/8/2006  
 Time Period

## Site Information

Intersection William Field Rd at Power Road  
 Area Type All other areas  
 Jurisdiction Gilbert  
 Analysis Year  
 Project ID Williams Field Road at Power Road  
 PM PK Hr-2025

## Volume and Timing Input

			EB			WB			NB			SB		
			LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, N <sub>i</sub>			1	3	0	1	3	0	1	3	0	1	3	0
Lane Group			L	TR		L	TR		L	TR		L	TR	
Volume, V (vph)			250	203	451	10	269	1	399	552	9	4	644	10
% Heavy Vehicles, %HV			0	0	0	0	0	0	0	0	0	0	0	0
Peak-Hour Factor, PHF			0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Pre-timed (P) or Actuated (A)			A	A	A	A	A	A	A	A	A	A	A	A
Start-up Lost Time, l <sub>i</sub>			2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Extension of Effective Green, e			2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Arrival Type, AT			3	3		3	3		3	3		3	3	
Unit Extension, UE			3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Filtering/Metering, I			1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Initial Unmet Demand, Q <sub>b</sub>			0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Ped / Bike / RTOR Volumes			0	0	60	0	0	0	0	0	0	0	0	10
Lane Width			12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Parking / Grade / Parking			N	0	N	N	0	N	N	0	N	N	0	N
Parking Maneuvers, N <sub>m</sub>														
Buses Stopping, N <sub>b</sub>			0	0		0	0		0	0		0	0	
Min. Time for Pedestrians, G <sub>p</sub>			3.2			3.2			3.2			3.2		
Phasing	EW Perm	02	03		04		NS Perm		NB Only		07		08	
Timing	G = 23.0	G =	G =		G =		G = 25.0		G = 13.0		G =		G =	
	Y = 4	Y =	Y =		Y =		Y = 4		Y = 6		Y =		Y =	
Duration of Analysis, T = 0.25									Cycle Length, C = 75.0					

## Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, v	272	646		11	293		434	610		4	1439	
Lane Group Capacity, c	329	1431		191	1586		510	2891		252	1592	
v/c Ratio, X	0.83	0.45		0.06	0.18		0.85	0.21		0.02	0.90	
Total Green Ratio, g/C	0.31	0.31		0.31	0.31		0.56	0.56		0.33	0.33	
Uniform Delay, d <sub>1</sub>	24.1	20.9		18.4	19.1		24.7	8.2		16.8	23.9	
Progression Factor, PF	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Delay Calibration, k	0.36	0.11		0.11	0.11		0.38	0.11		0.11	0.43	
Incremental Delay, d <sub>2</sub>	15.8	0.2		0.1	0.1		13.0	0.0		0.0	7.7	
Initial Queue Delay, d <sub>3</sub>	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay	40.0	21.2		18.5	19.2		37.7	8.3		16.8	31.5	
Lane Group LOS	D	C		B	B		D	A		B	C	
Approach Delay	26.7			19.1			20.5			31.5		
Approach LOS	C			B			C			C		
Intersection Delay	26.2			X <sub>c</sub> = 0.89			Intersection LOS			C		



1/8/2006

## BACK-OF-QUEUE WORKSHEET

## General Information

Project Description Williams Field Road at Power Road PM Pk Hr-2025

## Average Back of Queue

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane Group	L	TR		L	TR		L	TR		L	TR	
Initial Queue/Lane	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Flow Rate/Lane Group	272	646		11	293		434	610		4	1439	
Platflow/Lane	1074	1712		623	1899		912	1895		757	1753	
Capacity/Lane Group	329	1431		191	1586		510	2891		252	1592	
Flow Ratio	0.3	0.1		0.0	0.1		0.5	0.1		0.0	0.3	
v/c Ratio	0.83	0.45		0.06	0.18		0.85	0.21		0.02	0.90	
Factor	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Arrival Type	3	3		3	3		3	3		3	3	
Platoon Ratio	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
PF Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
	5.3	4.0		0.2	1.6		4.9	2.3		0.1	10.5	
	0.3	0.4		0.2	0.4		0.4	0.6		0.3	0.4	
	1.3	0.3		0.0	0.1		2.0	0.2		0.0	3.0	
Average	6.5	4.3		0.2	1.7		6.9	2.5		0.1	13.5	

## Percentile Back of Queue (95th percentile)

	1.9	2.0		2.1	2.0		1.9	2.0		2.1	1.8	
Back of Queue	12.6	8.5		0.4	3.6		13.1	5.0		0.1	24.0	

## Queue Storage Ratio

Queue Spacing	25.0	25.0		25.0	25.0		25.0	25.0		25.0	25.0	
Queue Storage	0	0		0	0		0	0		0	0	
Average Queue Storage Ratio												
% Queue Storage Ratio												

1/8/2006

## TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	MG	Intersection	Cooley Loop S./Cooley Loop W.
Agency/Co.	TASK Eng	Jurisdiction	Gilbert
Date Performed	8/8/2006	Analysis Year	2025
Analysis Time Period	AM PK Hr-2025		

Project Description Cooley Loop South at Cooley Loop West AM PK Hr-2025

East/West Street: Cooley Loop South

North/South Street: Cooley Loop West

Intersection Orientation: East-West

Study Period (hrs): 0.25

## Vehicle Volumes and Adjustments

Major Street Movement	Eastbound			Westbound		
	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	5	5	5	5	307	42
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR (veh/h)	5	5	5	5	333	45
Percent Heavy Vehicles	0	-	-	0	-	-

Median Type	Undivided					
Channelized			0			0
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR
Stream Signal		0			0	

Minor Street Movement	Northbound			Southbound		
	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	5	93	53	5	455	5
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR (veh/h)	5	101	57	5	494	5
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Controlled Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR

## Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	L	L		TR	L		TR
Volume (veh/h)	5	5	5		158	5		499
Queue (m) (veh/h)	1192	1623	85		652	413		548
PHF	0.00	0.00	0.06		0.24	0.01		0.97
% queue length	0.01	0.01	0.18		0.95	0.04		10.96
Control Delay (s/veh)	8.0	7.2	50.0		12.3	13.8		47.1
LOS	A	A	E		B	B		E
Approach Delay (s/veh)	-	-	13.4			46.8		
Approach LOS	-	-	B			E		

1/8/2006

## TWO-WAY STOP CONTROL SUMMARY

General Information			Site Information	
Analyst	MG		Intersection	Cooley Loop S/Cooley Loop W.
Agency/Co.	TASK Eng		Jurisdiction	Gilbert
Date Performed	8/8/2006		Analysis Year	2025
Analysis Time Period	PM PK Hr-2025			

Project Description Cooley Loop South at Cooley Loop West PM Pk Hr-2025

East/West Street: Cooley Loop South

North/South Street: Cooley Loop West

Intersection Orientation: East-West

Study Period (hrs): 0.25

## Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	5	5	5	5	64	17
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR (veh/h)	5	5	5	5	69	18
Percent Heavy Vehicles	0	-	-	0	-	-
Median Type	Undivided					
Channelized			0			0
Lines	1	1	0	1	1	0
Configuration	L		TR	L		TR
Stream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	5	406	224	5	124	5
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR (veh/h)	5	441	243	5	134	5
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Red Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lines	1	1	0	1	1	0
Configuration	L		TR	L		TR

## Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Line Configuration	L	L	L		TR	L		TR
Volume (veh/h)	5	5	5		684	5		139
Queue (m) (veh/h)	1522	1623	680		861	222		787
	0.00	0.00	0.01		0.79	0.02		0.18
% queue length	0.01	0.01	0.02		8.40	0.07		0.64
Control Delay (s/veh)	7.4	7.2	10.3		23.2	21.6		10.6
LOS	A	A	B		C	C		B
Approach Delay (s/veh)	-	-	23.1			10.9		
Approach LOS	-	-	C			B		

11/8/2006

## HCS+™ DETAILED REPORT

## General Information

Analyst MG  
 Agency or Co. TASK Eng  
 Date Performed 8/8/2006  
 Time Period

## Site Information

Intersection Recker Rd/Cooley Loop South  
 Area Type All other areas  
 Jurisdiction Gilbert  
 Analysis Year  
 Project ID Recker Road at Cooley Loop South  
 AM Pk Hr-2025

## Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, N <sub>i</sub>	1	1	0	1	1	0	1	2	0	1	2	0
Lane Group	L	TR		L	TR		L	TR		L	TR	
Volume, V (vph)	7	12	28	72	103	80	15	1090	61	64	869	
% Heavy Vehicles, %HV	0	0	0	0	0	0	0	0	0	0	0	
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Pretimed (P) or Actuated (A)	A	A	A	A	A	A	A	A	A	A	A	A
Start-up Lost Time, h	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Extension of Effective Green, e	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Arrival Type, AT	3	3		3	3		3	3		3	3	
Unit Extension, UE	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Filtering/Metering, I	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Initial Unmet Demand, Q <sub>b</sub>	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Ped / Bike / RTOR Volumes	0	0	0	0	0	0	0	0	40	0	0	10
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking Maneuvers, N <sub>m</sub>												
Buses Stopping, N <sub>b</sub>	0	0		0	0		0	0		0	0	
Min. Time for Pedestrians, G <sub>p</sub>	3.2			3.2			3.2			3.2		
Phasing	EW Perm	WB Only	03	04	NS Perm	Excl. Left	07	08				
Timing	G = 25.2	G = 3.0	G =	G =	G = 35.0	G = 10.4	G =	G =				
	Y = 4	Y = 0	Y =	Y =	Y = 4	Y = 0	Y =	Y =				
Duration of Analysis, T = 0.25							Cycle Length, C = 81.6					

## Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, v	8	43		78	199		16	1208		70	1018	
Lane Group Capacity, c	340	525		559	700		419	1547		412	1535	
v/c Ratio, X	0.02	0.08		0.14	0.28		0.04	0.78		0.17	0.66	
Total Green Ratio, g/C	0.31	0.31		0.39	0.39		0.61	0.43		0.61	0.43	
Uniform Delay, d <sub>1</sub>	19.6	20.0		16.7	16.8		17.0	20.0		22.3	18.6	
Progression Factor, PF	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Delay Calibration, k	0.11	0.11		0.11	0.11		0.11	0.33		0.11	0.24	
Incremental Delay, d <sub>2</sub>	0.0	0.1		0.1	0.2		0.0	2.7		0.2	1.1	
Initial Queue Delay, d <sub>3</sub>	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay	19.7	20.1		16.9	17.1		17.0	22.7		22.5	19.7	
Lane Group LOS	B	C		B	B		B	C		C	B	
Approach Delay	20.0			17.0			22.6			19.9		
Approach LOS	C			B			C			B		
Intersection Delay	20.8			X <sub>c</sub> = 0.47			Intersection LOS			C		

11/8/2006

## BACK-OF-QUEUE WORKSHEET

## General Information

Project Description Recker Road at Cooley Loop South AM Pk Hr-2025

## Average Back of Queue

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane Group	L	TR		L	TR		L	TR		L	TR	
Initial Queue/Lane	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Flow Rate/Lane Group	8	43		78	199		16	1208		70	1018	
Satflow/Lane	1100	1701		1417	1775		692	1894		680	1879	
Capacity/Lane Group	340	525		559	700		419	1547		412	1535	
Flow Ratio	0.0	0.0		0.1	0.1		0.0	0.3		0.1	0.3	
v/c Ratio	0.02	0.08		0.14	0.28		0.04	0.78		0.17	0.66	
Factor	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Arrival Type	3	3		3	3		3	3		3	3	
Platoon Ratio	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
PF Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
	0.1	0.7		1.1	3.1		0.1	12.3		0.6	9.7	
	0.3	0.4		0.5	0.5		0.4	0.6		0.4	0.6	
Q2	0.0	0.0		0.1	0.2		0.0	1.9		0.1	1.1	
Average	0.1	0.7		1.2	3.3		0.2	14.2		0.7	10.7	

## Percentile Back of Queue (95th percentile)

	2.1	2.1		2.1	2.0		2.1	1.8		2.1	1.8	
Back of Queue	0.3	1.5		2.4	6.6		0.3	25.2		1.5	19.7	

## Queue Storage Ratio

Queue Spacing	25.0	25.0		25.0	25.0		25.0	25.0		25.0	25.0	
Queue Storage	0	0		0	0		0	0		0	0	
Average Queue Storage Ratio												
% Queue Storage Ratio												

11/8/2006

## HCS+™ DETAILED REPORT

General Information				Site Information			
Analyst	MG			Intersection	Recker Rd/Cooley Loop South		
Agency or Co.	TASK Eng			Area Type	All other areas		
Date Performed	8/8/2006			Jurisdiction	Gilbert		
Time Period				Analysis Year			
				Project ID	Recker Road at Cooley Loop South PM Pk Hr-2025		

## Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, N <sub>l</sub>	1	1	0	1	1	0	1	2	0	1	2	
Lane Group	L	TR		L	TR		L	TR		L	TR	
Volume, V (vph)	30	62	107	81	36	186	21	810	72	131	1433	
% Heavy Vehicles, %HV	0	0	0	0	0	0	0	0	0	0	0	
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Pretimed (P) or Actuated (A)	A	A	A	A	A	A	A	A	A	A	A	A
Start-up Lost Time, t <sub>l</sub>	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Extension of Effective Green, e	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Arrival Type, AT	3	3		3	3		3	3		3	3	
Unit Extension, UE	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Filtering/Metering, I	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Initial Unmet Demand, Q <sub>b</sub>	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Ped / Bike / RTOR Volumes	0	0	60	0	0	0	0	0	40	0	0	10
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking Maneuvers, N <sub>m</sub>												
Buses Stopping, N <sub>b</sub>	0	0		0	0		0	0		0	0	
Min. Time for Pedestrians, G <sub>p</sub>	3.2			3.2			3.2			3.2		
Phasing	EW Perm	WB Only	03	04		NS Perm	Excl. Left		07		08	
Timing	G = 25.2	G = 3.0	G =	G =		G = 35.0	G = 10.4		G =		G =	
	Y = 4	Y = 0	Y =	Y =		Y = 4	Y = 0		Y =		Y =	
Duration of Analysis, T = 0.25								Cycle Length, C = 81.6				

## Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, v	33	118		88	241		23	915		142	1562	
Lane Group Capacity, c	306	549		492	655		412	1543		450	1551	
v/c Ratio, X	0.11	0.21		0.18	0.37		0.06	0.59		0.32	1.01	
Total Green Ratio, g/C	0.31	0.31		0.39	0.39		0.61	0.43		0.61	0.43	
Uniform Delay, d <sub>1</sub>	20.2	20.9		18.7	17.5		24.8	17.8		19.5	23.3	
Progression Factor, PF	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Delay Calibration, k	0.11	0.11		0.11	0.11		0.11	0.18		0.11	0.50	
Incremental Delay, d <sub>2</sub>	0.2	0.2		0.2	0.4		0.1	0.6		0.4	24.6	
Initial Queue Delay, d <sub>3</sub>	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay	20.3	21.1		18.9	17.8		24.8	18.5		19.9	47.9	
Lane Group LOS	C	C		B	B		C	B		B	D	
Approach Delay	20.9			18.1			18.6			45.6		
Approach LOS	C			B			B			D		
Intersection Delay	33.4			X <sub>c</sub> = 0.61			Intersection LOS			C		

11/8/2006

# BACK-OF-QUEUE WORKSHEET

## General Information

Project Description Recker Road at Cooley Loop South PM Pk Hr-2025

## Average Back of Queue

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane Group	L	TR		L	TR		L	TR		L	TR	
Initial Queue/Lane	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Flow Rate/Lane Group	33	118		88	241		23	915		142	1562	
Satflow/Lane	990	1777		1246	1661		680	1889		743	1899	
Capacity/Lane Group	306	549		492	655		412	1543		450	1551	
Flow Ratio	0.0	0.1		0.1	0.1		0.0	0.3		0.2	0.4	
w/c Ratio	0.11	0.21		0.18	0.37		0.06	0.59		0.32	1.01	
Factor	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Arrival Type	3	3		3	3		3	3		3	3	
Platoon Ratio	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
PF Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
	0.5	2.0		1.2	3.9		0.2	8.3		1.3	18.6	
	0.3	0.5		0.4	0.5		0.4	0.6		0.4	0.6	
	0.0	0.1		0.1	0.3		0.0	0.8		0.2	8.1	
Average	0.6	2.1		1.3	4.2		0.2	9.1		1.5	26.6	

## Percentile Back of Queue (95th percentile)

	2.1	2.0		2.1	2.0		2.1	1.9		2.1	1.6	
Back of Queue	1.2	4.3		2.7	8.2		0.5	17.0		3.1	43.6	

## Queue Storage Ratio

Queue Spacing	25.0	25.0		25.0	25.0		25.0	25.0		25.0	25.0	
Queue Storage	0	0		0	0		0	0		0	0	
Average Queue Storage Ratio												
% Queue Storage Ratio												

1/8/2006

## TWO-WAY STOP CONTROL SUMMARY

General Information			Site Information	
Analyst	MG		Intersection	Cooley Loop S/Cooley Loop E.
Agency/Co.	TASK Eng		Jurisdiction	Gilbert
Date Performed	8/8/2006		Analysis Year	2025
Analysis Time Period	AM PK Hr-2025			

Project Description Cooley Loop South at Cooley Loop East AM PK Hr-2025

East/West Street: Cooley Loop South

North/South Street: Cooley Loop East

Intersection Orientation: East-West

Study Period (hrs): 0.25

## Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	30		5			
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR (veh/h)	32	0	5	0	0	0
Percent Heavy Vehicles	0	-	-	0	-	-
Median Type	Undivided					
Channelized			0			0
Lanes	0	0	0	0	0	0
Configuration	LTR	LR				
Stream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	19	336			105	7
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR (veh/h)	20	365	0	0	114	7
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Shared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	1	1	0	0	1	0
Configuration	L	T				TR

## Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	LTR		L	T				
Volume (veh/h)	32		20	365				121
Length (m) (veh/h)	1636		744	813				821
v/c	0.02		0.03	0.45				0.13
% queue length	0.06		0.08	2.35				0.52
Control Delay (s/veh)	7.2		10.0	13.0				11.0
LOS	A		A	B				B
Approach Delay (s/veh)	-	-	12.8			10.1		
Approach LOS	-	-	B			B		



11/8/2006

# TWO-WAY STOP CONTROL SUMMARY

General Information			Site Information	
Analyst	MG		Intersection	Cooley Loop S./Cooley Loop E.
Agency/Co.	TASK Eng		Jurisdiction	Gilbert
Date Performed	8/8/2006		Analysis Year	2025
Analysis Time Period	PM PK Hr-2025			

Project Description Cooley Loop South at Cooley Loop East PM Pk Hr-2025

East/West Street: Cooley Loop South	North/South Street: Cooley Loop East
Intersection Orientation: East-West	Study Period (hrs): 0.25

## Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	18		5			
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR (veh/h)	19	0	5	0	0	0
Percent Heavy Vehicles	0	-	-	0	-	-
Median Type	Undivided					
Channelized			0			0
Lines	0	0	0	0	0	0
Configuration	LTR	LR				
Stream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	24	247			376	42
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR (veh/h)	26	268	0	0	408	45
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Shared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lines	1	1	0	0	1	0
Configuration	L	T				TR

## Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Line Configuration	LTR		L	T				TR
Volume (veh/h)	19		26	268				453
Queue (m) (veh/h)	1636		407	846				862
Queue (m)	0.01		0.06	0.32				0.53
% queue length	0.04		0.20	1.37				3.13
Control Delay (s/veh)	7.2		14.4	11.2				13.7
LOS	A		B	B				B
Approach Delay (s/veh)	-	-	11.5			13.7		
Approach LOS	-	-	B			B		

11/8/2006

## HCS+™ DETAILED REPORT

## General Information

Analyst MG  
 Agency or Co. TASK Eng  
 Date Performed 8/8/2006  
 Time Period

## Site Information

Intersection Recker Rd at Boulevard Road  
 Area Type All other areas  
 Jurisdiction Gilbert  
 Analysis Year  
 Project ID Recker Road at Boulevard Road AM  
 Pk Hr-2025

## Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, N <sub>i</sub>	1	1	0	1	1	0	1	2	0	2	2	
Lane Group	L	TR		L	TR		L	TR		L	TR	
Volume, V (vph)	214	3	48	58	2	310	13	779	36	128	790	
% Heavy Vehicles, %HV	0	0	0	0	0	0	0	0	0	0	0	
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Pretimed (P) or Actuated (A)	A	A	A	A	A	A	A	A	A	A	A	
Start-up Lost Time, l <sub>i</sub>	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Extension of Effective Green, e	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Arrival Type, AT	3	3		3	3		3	3		3	3	
Unit Extension, UE	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Filtering/Metering, I	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Initial Unmet Demand, Q <sub>b</sub>	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Ped / Bike / RTOR Volumes	0	0	0	0	0	0	0	0	0	0	0	10
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking Maneuvers, N <sub>m</sub>												
Buses Stopping, N <sub>b</sub>	0	0		0	0		0	0		0	0	
Min. Time for Pedestrians, G <sub>p</sub>	3.2			3.2			3.2			3.2		
Phasing	EW Perm	WB Only	03	04	NS Perm	Excl. Left	07	08				
Timing	G = 25.2	G = 3.0	G =	G =	G = 35.0	G = 10.4	G =	G =				
	Y = 4	Y = 0	Y =	Y =	Y = 4	Y = 0	Y =	Y =				
Duration of Analysis, T = 0.25							Cycle Length, C = 81.6					

## Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, v	233	55		63	339		14	886		139	904	
Lane Group Capacity, c	230	504		548	638		454	1542		1108	1540	
v/c Ratio, X	1.01	0.11		0.11	0.53		0.03	0.57		0.13	0.59	
Total Green Ratio, g/C	0.31	0.31		0.39	0.39		0.61	0.43		0.61	0.43	
Uniform Delay, d <sub>1</sub>	28.2	20.2		16.8	18.9		15.0	17.7		15.4	17.8	
Progression Factor, PF	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Delay Calibration, k	0.50	0.11		0.11	0.13		0.11	0.17		0.11	0.18	
Incremental Delay, d <sub>2</sub>	62.7	0.1		0.1	0.9		0.0	0.5		0.1	0.6	
Initial Queue Delay, d <sub>3</sub>	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay	90.9	20.3		16.9	19.8		15.0	18.2		15.4	18.4	
Lane Group LOS	F	C		B	B		B	B		B	B	
Approach Delay	77.4			19.3			18.1			18.0		
Approach LOS	E			B			B			B		
Intersection Delay	24.7			X <sub>c</sub> = 0.63			Intersection LOS			C		

11/8/2006

# BACK-OF-QUEUE WORKSHEET

## General Information

Project Description Recker Road at Boulevard Road AM Pk Hr-2025

## Average Back of Queue

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane Group	L	TR		L	TR		L	TR		L	TR	
Initial Queue/Lane	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Flow Rate/Lane Group	233	55		63	339		14	886		139	904	
Flow/Lane	745	1631		1389	1617		749	1887		942	1886	
Capacity/Lane Group	230	504		548	638		454	1542		1108	1540	
Flow Ratio	0.3	0.0		0.0	0.2		0.0	0.2		0.1	0.3	
Capacity Ratio	1.01	0.11		0.11	0.53		0.03	0.57		0.13	0.59	
Factor	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Arrival Type	3	3		3	3		3	3		3	3	
Ratio	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
1	5.3	0.9		0.9	5.9		0.1	8.0		0.6	8.2	
2	0.3	0.4		0.5	0.5		0.4	0.6		0.5	0.6	
3	3.0	0.1		0.1	0.6		0.0	0.8		0.1	0.8	
Average	8.3	0.9		0.9	6.4		0.1	8.7		0.7	9.0	

## Percentile Back of Queue (95th percentile)

	1.9	2.1		2.1	1.9		2.1	1.9		2.1	1.9	
Back of Queue	15.5	2.0		1.9	12.4		0.3	16.4		1.5	16.8	

## Queue Storage Ratio

Queue Spacing	25.0	25.0		25.0	25.0		25.0	25.0		25.0	25.0	
Queue Storage	0	0		0	0		0	0		0	0	
Average Queue Storage Ratio												
% Queue Storage Ratio												

11/8/2006

## HCS+™ DETAILED REPORT

## General Information

Analyst  
 Agency or Co. TASK Eng  
 Date Performed 8/8/2006  
 Time Period

## Site Information

Intersection Recker Rd at Boulevard Road  
 Area Type All other areas  
 Jurisdiction Gilbert  
 Analysis Year  
 Project ID Recker Road at Boulevard Road PM  
 Pk Hr-2025

## Volume and Timing Input

			EB			WB			NB			SB		
			LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, N <sub>i</sub>			1	1	0	1	1	0	1	2	0	1	2	
Lane Group			L	TR		L	TR		L	TR		L	TR	
Volume, V (vph)			118	3	28	107	3	189	26	596	74	445	945	
% Heavy Vehicles, %HV			0	0	0	0	0	0	0	0	0	0	0	
Peak-Hour Factor, PHF			0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Pretimed (P) or Actuated (A)			A	A	A	A	A	A	A	A	A	A	A	
Start-up Lost Time, l <sub>i</sub>			2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Extension of Effective Green, e			2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Arrival Type, AT			3	3		3	3		3	3		3	3	
Unit Extension, UE			3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Filtering/Metering, I			1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Initial Unmet Demand, Q <sub>b</sub>			0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Ped / Bike / RTOR Volumes			0	0	0	0	0	0	0	0	40	0	0	10
Lane Width			12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Parking / Grade / Parking			N	0	N	N	0	N	N	0	N	N	0	N
Parking Maneuvers, N <sub>m</sub>														
Buses Stopping, N <sub>b</sub>			0	0		0	0		0	0		0	0	
Min. Time for Pedestrians, G <sub>p</sub>			3.2			3.2			3.2			3.2		
Phasing	EW Perm	WB Only	03			04		NS Perm		Excl. Left		07		08
Timing	G = 25.2	G = 3.0	G =			G =		G = 35.0		G = 10.4		G =		G =
	Y = 4	Y = 0	Y =			Y =		Y = 4		Y = 0		Y =		Y =
Duration of Analysis, T = 0.25									Cycle Length C = 81.6					

## Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, v	128	33		116	208		28	685		484	1267	
Lane Group Capacity, c	332	507		569	639		412	1539		532	1508	
v/c Ratio, X	0.39	0.07		0.20	0.33		0.07	0.45		0.91	0.84	
Total Green Ratio, g/C	0.31	0.31		0.39	0.39		0.61	0.43		0.61	0.43	
Uniform Delay, d <sub>1</sub>	22.1	19.9		17.0	17.2		22.3	16.4		24.7	20.8	
Progression Factor, PF	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Delay Calibration, k	0.11	0.11		0.11	0.11		0.11	0.11		0.43	0.38	
Incremental Delay, d <sub>2</sub>	0.7	0.1		0.2	0.3		0.1	0.2		19.7	4.4	
Initial Queue Delay, d <sub>3</sub>	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay	22.9	19.9		17.2	17.5		22.4	16.7		44.4	25.2	
Lane Group LOS	C	B		B	B		C	B		D	C	
Approach Delay	22.3			17.4			16.9			30.5		
Approach LOS	C			B			B			C		
Intersection Delay	25.3			X <sub>c</sub> = 0.71			Intersection LOS			C		

11/8/2006

## BACK-OF-QUEUE WORKSHEET

## General Information

Project Description Recker Road at Boulevard Road PM Pk Hr-2025

## Average Back of Queue

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane Group	L	TR		L	TR		L	TR		L	TR	
Initial Queue/Lane	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Flow Rate/Lane Group	128	33		116	208		28	685		484	1267	
Flow/Lane	1076	1641		1440	1619		680	1884		878	1846	
Capacity/Lane Group	332	507		569	639		412	1539		532	1508	
Flow Ratio	0.1	0.0		0.1	0.1		0.0	0.2		0.6	0.4	
Capacity Ratio	0.39	0.07		0.20	0.33		0.07	0.45		0.91	0.84	
Factor	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Arrival Type	3	3		3	3		3	3		3	3	
Platoon Ratio	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
F Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
g2	2.3	0.5		1.6	3.3		0.3	5.7		5.2	13.5	
	0.3	0.4		0.5	0.5		0.4	0.6		0.4	0.6	
	0.2	0.0		0.1	0.2		0.0	0.5		3.0	2.6	
Average	2.5	0.6		1.7	3.5		0.3	6.2		8.2	16.0	

## Percentile Back of Queue (95th percentile)

	2.0	2.1		2.0	2.0		2.1	1.9		1.9	1.7	
Back of Queue	5.0	1.2		3.6	7.0		0.6	11.9		15.3	28.0	

## Queue Storage Ratio

Queue Spacing	25.0	25.0		25.0	25.0		25.0	25.0		25.0	25.0	
Queue Storage	0	0		0	0		0	0		0	0	
Average Queue Storage Ratio												
% Queue Storage Ratio												

1/8/2006

## HCS+ DETAILED REPORT

General Information				Site Information			
Analyst	MG	Intersection	Recker Rd at Pecos Road	Area Type	All other areas	Jurisdiction	Gilbert
Agency or Co.	TASK Eng	Analysis Year		Project ID	Recker Road at Pecos Road AM Pk Hr-2025		
Date Performed	8/8/2006						
Time Period							

Volume and Timing Input												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, N <sub>i</sub>	1	3	0	1	3	0	1	2	0	1	2	
Lane Group	L	TR		L	TR		L	TR		L	TR	
Volume, V (vph)	44	1228	190	149	741	30	264	593	219	39	343	
% Heavy Vehicles, %HV	0	0	0	0	0	0	0	0	0	0	0	
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Pretimed (P) or Actuated (A)	A	A	A	A	A	A	A	A	A	A	A	
Start-up Lost Time, l <sub>i</sub>	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Extension of Effective Green, e	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Arrival Type, AT	3	3		3	3		3	3		3	3	
Unit Extension, UE	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Filtering/Metering, I	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Initial Unmet Demand, Q <sub>b</sub>	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Ped / Bike / RTOR Volumes	0	0	0	0	0	0	0	0	40	0	0	10
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking Maneuvers, N <sub>m</sub>												
Buses Stopping, N <sub>b</sub>	0	0		0	0		0	0		0	0	
Min. Time for Pedestrians, G <sub>p</sub>	3.2			3.2			3.2			3.2		
Phasing	EW Perm	Excl. Left	03	04	NS Perm	Excl. Left	07	08				
Timing	G = 25.2	G = 3.0	G =	G =	G = 15.0	G = 5.4	G =	G =				
	Y = 4	Y = 0	Y =	Y =	Y = 4	Y = 0	Y =	Y =				
Duration of Analysis, T = 0.25							Cycle Length, C = 56.6					

## Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, v	48	1542		162	838		287	840		42	518	
Lane Group Capacity, c	426	2258		357	2291		434	925		434	919	
v/c Ratio, X	0.11	0.68		0.45	0.37		0.66	0.91		0.10	0.56	
Total Green Ratio, g/C	0.57	0.45		0.57	0.45		0.43	0.27		0.43	0.27	
Uniform Delay, d <sub>1</sub>	9.1	12.5		17.3	10.4		18.6	20.1		16.7	18.0	
Progression Factor, PF	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Delay Calibration, k	0.11	0.25		0.11	0.11		0.24	0.43		0.11	0.16	
Incremental Delay, d <sub>2</sub>	0.1	0.9		0.9	0.1		3.7	12.6		0.1	0.8	
Initial Queue Delay, d <sub>3</sub>	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay	9.3	13.4		18.2	10.5		22.3	32.8		16.8	18.8	
Lane Group LOS	A	B		B	B		C	C		B	B	
Approach Delay	13.3			11.7			30.1			18.6		
Approach LOS	B			B			C			B		
Intersection Delay	18.0			X <sub>c</sub> = 0.81			Intersection LOS			B		

11/8/2006

## BACK-OF-QUEUE WORKSHEET

## General Information

Project Description Recker Road at Pecos Road AM Pk Hr-2025

## Average Back of Queue

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane Group	L	TR		L	TR		L	TR		L	TR	
Initial Queue/Lane	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Flow Rate/Lane Group	48	1542		162	838		287	840		42	518	
Satflow/Lane	750	1861		629	1888		1007	1834		1007	1820	
Capacity/Lane Group	426	2258		357	2291		434	925		434	919	
Flow Ratio	0.1	0.3		0.3	0.2		0.3	0.2		0.0	0.1	
s/c Ratio	0.11	0.68		0.45	0.37		0.66	0.91		0.10	0.56	
Factor	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Arrival Type	3	3		3	3		3	3		3	3	
Platoon Ratio	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
PF Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
	0.3	7.1		1.2	3.2		2.9	6.7		0.4	3.7	
	0.3	0.5		0.3	0.5		0.3	0.3		0.3	0.3	
	0.0	1.0		0.2	0.3		0.6	2.4		0.0	0.4	
Average	0.4	8.1		1.4	3.5		3.5	9.1		0.4	4.1	

## Percentile Back of Queue (95th percentile)

	2.1	1.9		2.1	2.0		2.0	1.9		2.1	2.0	
Back of Queue	0.8	15.2		2.9	6.9		6.9	16.9		0.9	8.2	

## Queue Storage Ratio

Queue Spacing	25.0	25.0		25.0	25.0		25.0	25.0		25.0	25.0	
Queue Storage	0	0		0	0		0	0		0	0	
Average Queue Storage Ratio												
% Queue Storage Ratio												

1/8/2006

## HCS+™ DETAILED REPORT

## General Information

Analyst MG  
 Agency or Co. TASK Eng  
 Date Performed 8/8/2006  
 Time Period

## Site Information

Intersection Recker Rd at Pecos Road  
 Area Type All other areas  
 Jurisdiction Gilbert  
 Analysis Year  
 Project ID Recker Road at Pecos Road PM Pk  
 Hr-2025

## Volume and Timing Input

			EB			WB			NB			SB		
			LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, N <sub>i</sub>			1	3	0	1	3	0	1	2	0	1	2	0
Lane Group			L	TR		L	TR		L	TR		L	TR	
Volume, V (vph)			115	896	232	238	1355	64	255	475	125	26	613	64
% Heavy Vehicles, %HV			0	0	0	0	0	0	0	0	0	0	0	0
Peak-Hour Factor, PHF			0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Pretimed (P) or Actuated (A)			A	A	A	A	A	A	A	A	A	A	A	A
Start-up Lost Time, t <sub>l</sub>			2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Extension of Effective Green, e			2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Arrival Type, AT			3	3		3	3		3	3		3	3	
Unit Extension, UE			3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Filtering/Metering, I			1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Initial Unmet Demand, Q <sub>b</sub>			0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Ped / Bike / RTOR Volumes			0	0	0	0	0	0	0	0	40	0	0	10
Lane Width			12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Parking / Grade / Parking			N	0	N	N	0	N	N	0	N	N	0	N
Parking Maneuvers, N <sub>m</sub>														
Buses Stopping, N <sub>b</sub>			0	0		0	0		0	0		0	0	
Min. Time for Pedestrians, G <sub>p</sub>			3.2			3.2			3.2			3.2		
Phasing	EW Perm	Excl. Left	03		04		NS Perm		Excl. Left		07		08	
Timing	G = 25.2	G = 3.0	G =		G =		G = 15.0		G = 5.4		G =		G =	
	Y = 4	Y = 0	Y =		Y =		Y = 4		Y = 0		Y =		Y =	
Duration of Analysis, T = 0.25									Cycle Length, C = 56.6					

## Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, v	125	1226		259	1543		277	608		28	755	
Lane Group Capacity, c	357	2233		357	2288		434	937		434	942	
v/c Ratio, X	0.35	0.55		0.73	0.67		0.64	0.65		0.06	0.80	
Total Green Ratio, g/C	0.57	0.45		0.57	0.45		0.43	0.27		0.43	0.27	
Uniform Delay, d <sub>1</sub>	16.2	11.5		18.5	12.4		19.6	18.5		15.3	19.4	
Progression Factor, PF	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Delay Calibration, k	0.11	0.15		0.29	0.25		0.22	0.23		0.11	0.35	
Incremental Delay, d <sub>2</sub>	0.6	0.3		7.2	0.8		3.1	1.6		0.1	5.0	
Initial Queue Delay, d <sub>3</sub>	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Control Delay	16.8	11.8		25.7	13.2		22.7	20.1		15.4	24.5	
Lane Group LOS	B	B		C	B		C	C		B	C	
Approach Delay	12.3			15.0			20.9			24.1		
Approach LOS	B			B			C			C		
Intersection Delay	16.8			X <sub>c</sub> = 0.86			Intersection LOS			B		



11/8/2006

## BACK-OF-QUEUE WORKSHEET

## General Information

Project Description Recker Road at Pecos Road PM Pk Hr-2025

## Average Back of Queue

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Lane Group	L	TR		L	TR		L	TR		L	TR	
Initial Queue/Lane	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Flow Rate/Lane Group	125	1226		259	1543		277	608		28	755	
Outflow/Lane	629	1841		629	1886		1007	1856		1007	1866	
Capacity/Lane Group	357	2233		357	2288		434	937		434	942	
Flow Ratio	0.2	0.2		0.4	0.3		0.3	0.2		0.0	0.2	
v/c Ratio	0.35	0.55		0.73	0.67		0.64	0.65		0.06	0.80	
Factor	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Arrival Type	3	3		3	3		3	3		3	3	
Platoon Ratio	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
PF Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
	0.9	5.2		1.9	7.1		2.8	4.5		0.3	5.8	
	0.3	0.5		0.3	0.5		0.3	0.3		0.3	0.3	
	0.2	0.6		0.7	0.9		0.5	0.6		0.0	1.3	
Average	1.0	5.8		2.6	8.0		3.3	5.1		0.3	7.1	

## Percentile Back of Queue (95th percentile)

	2.1	1.9		2.0	1.9		2.0	2.0		2.1	1.9	
Back of Queue	2.1	11.1		5.3	15.1		6.6	9.9		0.6	13.5	

## Queue Storage Ratio

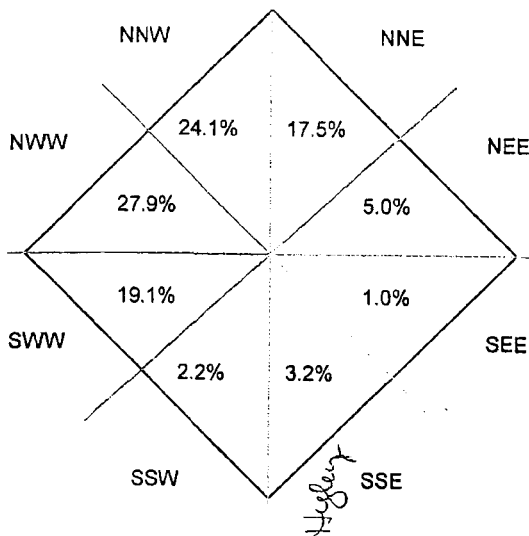
Queue Spacing	25.0	25.0		25.0	25.0		25.0	25.0		25.0	25.0	
Queue Storage	0	0		0	0		0	0		0	0	
Average Queue Storage Ratio												
% Queue Storage Ratio												

**MAG Trip Distribution**  
Version 1.3.0

Wednesday, August 2, 2006  
9:24 AM

Project Name: Cooley Station  
Project Location: Gilbert, AZ  
Analyst: SAD

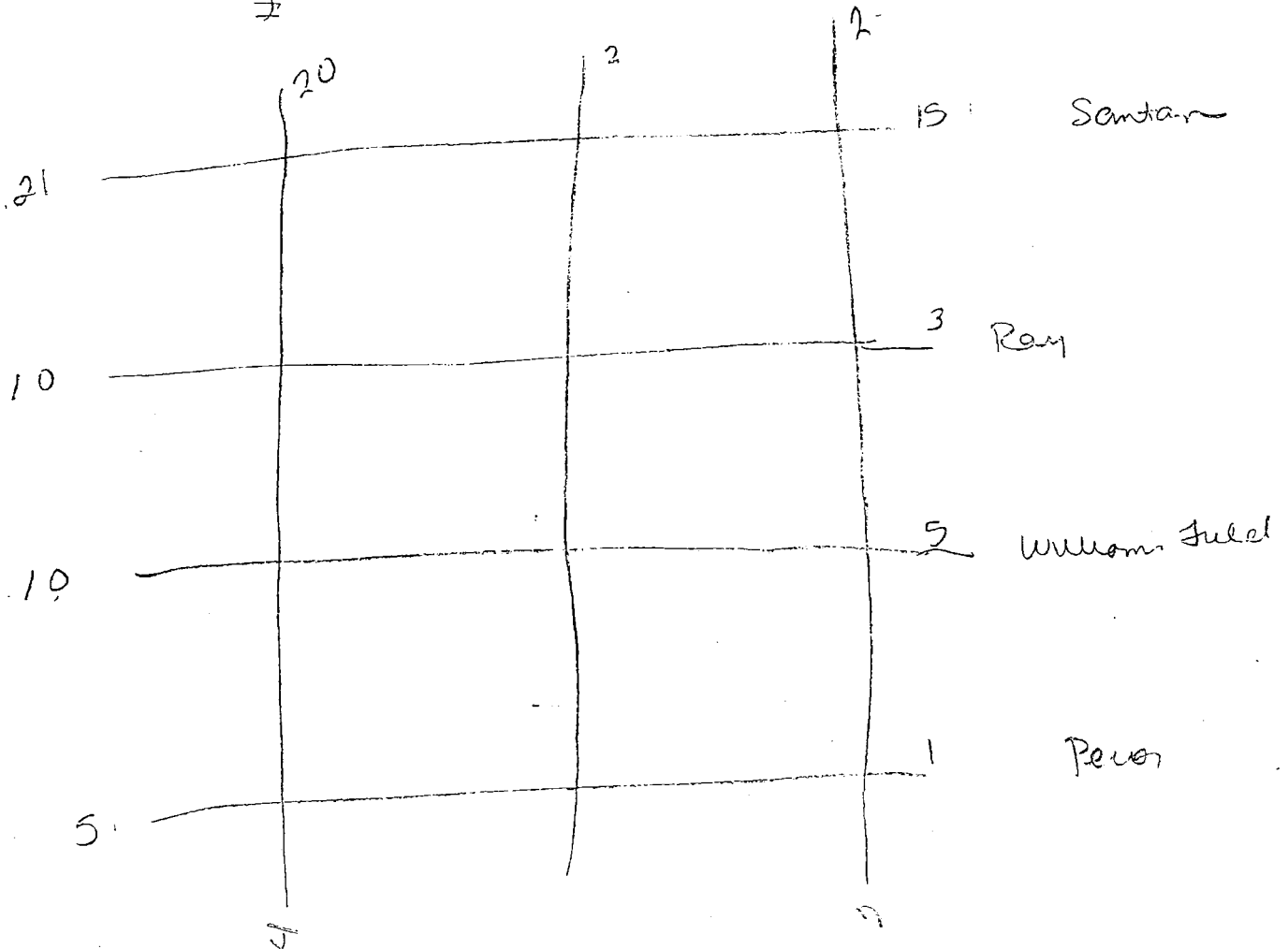
Location of Site: TAZ 1562  
Development Type being Analyzed: Residential and Employment 47.0% Weighted Employment  
Forecast Year: 2020  
Distance Out from Site (miles): 12



Bearing	% of Trips
NNE	17.5%
NEE	5.0%
SEE	1.0%
SSE	3.2%
SSW	2.2%
SWW	19.1%
NWW	27.9%
NNW	24.1%

*Recher*

*Power*



**APPENDIX C:**  
**ADJACENT TRIP GENERATION**

# Adjacent Park

TAZ	Parcel #	TC ID	Parcel Type	Units	Acres	Amount	L.U.C.	Daily Rate	AM Rate	PM Rate	% In AM	% In PM	Weekday	AM In	AM Out	PM In	PM Out
1	1	295	Park	Acres	100	100	412	2.28	0.01	0.06	80%	41%	228	1	0	2	4
				Sum of DUs		100							228	1	0	2	4

# Dibella

TAZ	Parcel #	TC ID	Parcel Type	Units	Acres	Amount	L.U.C.	Daily Rate	AM Rate	PM Rate	% In AM	% In PM	Weekday	AM In	AM Out	PM In	PM Out
1		300	Residential	DUs	56.5	1,413	220	6.72	0.51	0.62	20%	65%	9,492	144	576	569	307
2		298	Commercial	TGSF	19.3	210,177	820	52.36	1.16	4.86	61%	48%	11,005	149	95	490	531
				Sum of DUs		0							20,497	293	671	1,060	838

# Adjacent Existing High School

TAZ	Parcel #	TC ID	Parcel Type	Units	Acres	Amount	L.U.C.	Daily Rate	AM Rate	PM Rate	% In AM	% In PM	Weekday	AM In	AM Out	PM In	PM Out
1	1	302	High School	Students	NA	1200	530	1.71	0.41	0.28	69%	80%	2,052	339	153	269	67
													2,052	339	153	269	67

**APPENDIX D:**  
**ADJACENT PRODUCTIONS AND ATTRACTIONS**

# Adjacent Park

Adjacent Park																			
TAZ	Parcel #	TC ID	Parcel Type	Units		Acres	Amount	% Attractions	Trip Rates						Total				
				Weekday	AM In				AM Out	PM In	PM Out	Weekday	AM In	AM Out	PM In	PM Out			
1	1	295	Park		Acres	100	100	100%	0	0	0	0	0	0	228	1	0	2	4
				Sum of DUs			100		0	0	0	0	0	228	1	0	2	4	

# Dibella

Dibella																	
TAZ	Parcel #	TC ID	Parcel Type	Units	Acres	Amount	% Attractions	Trip Productions				Trip Attractions					
								Weekday	AM In	AM Out	PM In	PM Out	Weekday	AM In	AM Out	PM In	PM Out
1		300	Residential	DUs	56.5	1,413	5%	9,017	137	547	541	291	475	7	29	28	15
2		298	Commercial	TGSF	19.3	210,177	50%	5,502	74	48	245	266	5,502	74	48	245	266
				Sum of DUs		0		14,520	211	595	786	557	5,977	82	76	274	281

# Adjacent Existing High School

Adjacent Existing High School																				
								Trip Productions									Trip Attractions			
TAZ	Parcel #	TC ID	Parcel Type	Units	Acres	Amount	% Attractions	Weekday	AM In	AM Out	PM In	PM Out	Weekday	AM In	AM Out	PM In	PM Out			
1	1	302	High School	Students	NA	1200	85%	308	51	23	40	10	1,744	289	130	228	57			
								308	51	23	40	10	1,744	289	130	228	57			

**APPENDIX E:**

**FLORIDA DEPARTMENT OF TRANSPORTATION *QUALITY/LEVEL*  
*OF SERVICE HANDBOOK***

2002

# Quality/Level of Service

**HANDBOOK**

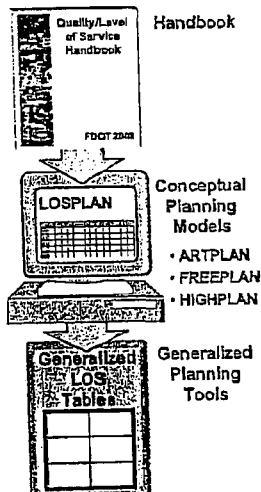
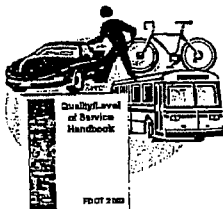


State of Florida  
Department of Transportation  
2002



Handbook used for roadway planning and preliminary engineering analyses

*This Handbook successfully combines the nation's leading automobile, bicycle, pedestrian, and bus evaluation techniques into a common analysis process.*



## EXECUTIVE SUMMARY

This Quality/Level of Service Handbook and its accompanying software are intended to be used by engineers, planners, and decision-makers in the development and review of roadway users' quality/level of service (Q/LOS) at planning and preliminary engineering levels. This Handbook provides tools to quantify multimodal transportation service inside the roadway environment (essentially inside the right-of-way).

These updated methods provide the first successful multimodal approach unifying the nation's leading automobile, bicycle, pedestrian and bus Q/LOS evaluation techniques into a common transportation analysis at facility and segment levels. With these professionally accepted techniques, analysts can now easily evaluate roadways from a multimodal perspective, which result in better multimodal decisions for projects in planning and preliminary engineering phases.

Two levels of analysis are included in this Handbook: (1) "generalized" planning and (2) "conceptual" planning. Generalized planning makes extensive use of statewide default values and is intended for broad applications such as statewide analyses, initial problem identification, and future year analyses. Conceptual planning is increasingly more detailed and accurate than generalized planning, but does not involve comprehensive operational analyses.

Generalized planning is most appropriate when a quick, "in the ball park" determination of LOS is needed. Florida's Generalized Tables found in this Handbook are the primary tools for conducting this type of planning analysis. The default values used for the Generalized Tables have been extensively researched and represent the most appropriate statewide values.

Conceptual planning is best suited for obtaining a solid determination of the LOS of a facility. Examples of conceptual planning are preliminary engineering applications, such as determining the design concept and scope for a facility (e.g., 4 through lanes with a raised median and bicycle lane), conducting alternatives analyses (e.g., 4 through lanes undivided versus 2 through lanes with a two-way left turn lane), and determining needs when a generalized planning approach is simply not accurate enough. Florida's LOS software (LOSPLAN),

## Implementation schedule

which includes ARTPLAN, FREEPLAN, and HIGHPLAN, is the easy to use tool for conducting these types of evaluations.

The techniques contained in this Handbook and the accompanying software are to be implemented immediately. After September 1, 2002, FDOT will not accept analyses using methods, techniques, volumes, or generalized tables from previous versions of this Handbook.

## Handbook changes

*Multimodal perspective includes bicycles, pedestrians, and buses as well as automobiles.*

*New freeway facility planning technique and updated software*

*Analytical methodologies for automobiles, bicycles, pedestrians, and buses.*

The most significant difference in this Handbook from previous editions is the multimodal perspective. In addition to traditional "highway" (automobile and truck) LOS analysis, state-of-the-art techniques are now provided allowing a simultaneous evaluation of the LOS for bicyclists, pedestrians, and buses. Although LOS techniques are provided for each roadway mode, FDOT recommends against combining their LOS into one overall roadway LOS. Other significant changes include a new freeway facility planning technique and completely updated software.

The updated methodologies are planning and preliminary engineering applications from the following primary resource documents and analytical techniques using actual Florida roadway, traffic and signalization data:

- 2000 Highway Capacity Manual (HCM2000) methodologies for automobiles and trucks;
- 1999 Transit Capacity and Quality of Service Manual (TCQSM) for buses;
- Bicycle LOS Model, the most used technique in the U.S. to evaluate LOS for bicyclists; and
- Pedestrian LOS Model, the most advanced technique in the U.S. to evaluate LOS for pedestrians.

## Florida's LOS standards

Also included are Florida's Statewide Minimum LOS Standards for the State Highway System. These standards are required for use on Florida Intrastate Highway System (FIHS) routes.

## User feedback

*Comments and suggestions are welcome.*

In order to make future editions of this Handbook and accompanying software even better, FDOT welcomes your review comments and suggestions. Chapter 8 contains a user survey and a software "bug" report form.

## Implementation schedule

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**TABLE 4 - 1**  
**GENERALIZED ANNUAL AVERAGE DAILY VOLUMES FOR FLORIDA'S**  
**URBANIZED AREAS\***

UNINTERRUPTED FLOW HIGHWAYS					
		Level of Service			
Lanes Divided		A	B	C	D E
2	Undivided	2,000	7,000	13,800	19,600 27,000
4	Divided	20,400	33,000	47,800	61,800 70,200
6	Divided	30,500	49,500	71,600	92,700 105,400
STATE TWO-WAY ARTERIALS					
Class I (>0.00 to 1.99 signalized intersections per mile)					
		Level of Service			
Lanes Divided		A	B	C	D E
2	Undivided	**	4,200	13,800	16,400 16,900
4	Divided	4,800	29,300	34,700	35,700 ***
6	Divided	7,300	44,700	52,100	53,500 ***
8	Divided	9,400	58,000	65,100	67,800 ***
Class II (2.00 to 4.50 signalized intersections per mile)					
		Level of Service			
Lanes Divided		A	B	C	D E
2	Undivided	**	1,900	11,200	15,400 16,300
4	Divided	**	4,100	26,000	32,700 34,500
6	Divided	**	6,500	40,300	49,200 51,800
8	Divided	**	8,500	53,300	63,800 67,000
Class III (more than 4.5 signalized intersections per mile and not within primary city central business district of an urbanized area over 750,000)					
		Level of Service			
Lanes Divided		A	B	C	D E
2	Undivided	**	**	5,300	12,600 15,500
4	Divided	**	**	12,400	28,900 32,800
6	Divided	**	**	19,500	44,700 49,300
8	Divided	**	**	25,800	58,700 63,800
Class IV (more than 4.5 signalized intersections per mile and within primary city central business district of an urbanized area over 750,000)					
		Level of Service			
Lanes Divided		A	B	C	D E
2	Undivided	**	**	5,200	13,700 15,000
4	Divided	**	**	12,300	30,300 31,700
6	Divided	**	**	19,100	45,800 47,600
8	Divided	**	**	25,900	59,900 62,200
NON-STATE ROADWAYS					
Major City/County Roadways					
		Level of Service			
Lanes Divided		A	B	C	D E
2	Undivided	**	**	9,100	14,600 15,600
4	Divided	**	**	21,400	31,100 32,900
6	Divided	**	**	33,400	46,800 49,300
Other Signalized Roadways (signalized intersection analysis)					
		Level of Service			
Lanes Divided		A	B	C	D E
2	Undivided	**	**	4,800	10,000 12,600
4	Divided	**	**	11,100	21,700 25,200
Source:		Florida Department of Transportation Systems Planning Office 605 Suwannee Street, MS 19 Tallahassee, FL 32399-0450 <a href="http://www11.myflorida.com/planning/systems/sm/los/default.htm">http://www11.myflorida.com/planning/systems/sm/los/default.htm</a>			
		02/22/02			

FREEWAYS					
Interchange spacing ≥ 2 mi. apart					
		Level of Service			
Lanes		A	B	C	D E
4		23,800	39,600	55,200	67,100 74,600
6		36,900	61,100	85,300	103,600 115,300
8		49,900	82,700	115,300	140,200 156,000
10		63,000	104,200	145,500	176,900 196,400
12		75,900	125,800	175,500	213,500 237,100
Interchange spacing < 2 mi. apart					
		Level of Service			
Lanes		A	B	C	D E
4		22,000	36,000	52,000	67,200 76,500
6		34,800	56,500	81,700	105,800 120,200
8		47,500	77,000	111,400	144,300 163,900
10		60,200	97,500	141,200	182,600 207,600
12		72,900	118,100	170,900	221,100 251,200
BICYCLE MODE					
(Note: Level of service for the bicycle mode in this table is based on roadway geometrics at 40 mph posted speed and traffic conditions, not number of bicyclists using the facility.) (Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)					
Paved Shoulder/ Bicycle Lane		Level of Service			
Coverage		A	B	C	D E
0-49%	**	**	**	3,200	13,800 >13,800
50-84%	**	**	2,500	4,100	>4,100 ***
85-100%	3,100	7,200	>7,200	***	***
PEDESTRIAN MODE					
(Note: Level of service for the pedestrian mode in this table is based on roadway geometrics at 40 mph posted speed and traffic conditions, not number of pedestrians using the facility.) (Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)					
Sidewalk Coverage		Level of Service			
		A	B	C	D E
0-49%	**	**	**	**	6,400 15,500
50-84%	**	**	**	**	9,900 19,000
85-100%	**	2,200	11,300	>11,300	***
BUS MODE (Scheduled Fixed Route)					
(Buses per hour)					
(Note: Buses per hour shown are only for the peak hour in the single direction of the higher traffic flow.)					
Sidewalk Coverage		Level of Service			
		A	B	C	D E
0-84%	**	>5	≥4	≥3	≥2
85-100%	>6	>4	≥3	≥2	≥1
ARTERIAL/NON-STATE ROADWAY ADJUSTMENTS					
DIVIDED/UNDIVIDED					
(alter corresponding volume by the indicated percent)					
Lanes	Median	Left Turns	Lanes	Adjustment Factors	
2	Divided	Yes		+5%	
2	Undivided	No		-20%	
Multi	Undivided	Yes		-5%	
Multi	Undivided	No		-25%	
ONE-WAY FACILITIES					
Decrease corresponding two-directional volumes in this table by 40% to obtain the equivalent one directional volume for one-way facilities.					

\*This table does not constitute a standard and should be used only for general planning applications. The computer models from which this table is derived should be used for more specific planning applications. The table and deriving computer models should not be used for corridor or intersection design, where more refined techniques exist. Values shown are two-way annual average daily volumes (based on K<sub>10</sub> factors) for levels of service and are for the automobile/truck modes unless specifically stated. Level of service letter grade thresholds are probably not comparable across modes and, therefore, cross modal comparisons should be made with caution. Furthermore, combining levels of service of different modes into one overall roadway level of service is not recommended. The table's input value defaults and level of service criteria appear on the following page. Calculations are based on planning applications of the Highway Capacity Manual, Bicycle LOS Model, Pedestrian LOS Model and Transit Capacity and Quality of Service Manual, respectively for the automobile/truck, bicycle, pedestrian and bus modes.

\*\*Cannot be achieved using table input value defaults.

\*\*\*Not applicable for that level of service letter grade. For automobile/truck modes, volumes greater than level of service D become F because intersection capacities have been reached. For bicycle and pedestrian modes, the level of service letter grade (including F) is not achievable, because there is no maximum vehicle volume threshold using table input value defaults.

85

TABLE 4 - 1 (continued)  
GENERALIZED ANNUAL AVERAGE DAILY VOLUMES FOR FLORIDA'S  
Urbanized Areas

INPUT VALUE ASSUMPTIONS

ROADWAY CHARACTERISTICS	UNINTERRUPTED FLOW FACILITIES			
	Freeway	Class III	Class IV	Highway
Number of through lanes		4-6	4-6	4-6
Posted speed (mph)		65	55	50
Free flow speed (mph)		70	60	55
Basic segment length (mi)		1.5	0	35
Interchange spacing per mile		2.5	1	
Median (ft)				Y
Left turn lanes (L/T)		1	1	Y
% no passing zone				80
Passing lane (ft)				n
TRAFFIC CHARACTERISTICS				
Planning analysis hour factor (K)		0.97	0.93	0.95
Directional distribution factor (D)		0.55	0.55	0.55
Peak hour factor (PHF)		0.95	0.95	0.925
Base capacity (ppph)		6.0	4.0	2.0
Heavy vehicle percent		0.98	1.00	1.0
Local adjustment factor				

ROADWAY CHARACTERISTICS	INTERRUPTED FLOW FACILITIES											
	State Arterial				Non-State Roadway				Other Signalized			
Number of through lanes	Class I	Class II	Class III	Class IV	Major City/County	Other Signalized	Other Signalized	Other Signalized	Other Signalized	Other Signalized	Other Signalized	Other Signalized
Posted speed (mph)	2 4-6 8	2 4-6 8	2 4-6 8	2 4-6 8	2 4-6 8	2 4-6 8	2 4-6 8	2 4-6 8	2 4-6 8	2 4-6 8	2 4-6 8	2 4-6 8
Free flow speed (mph)	45 50 55	45 50 55	45 50 55	45 50 55	45 50 55	45 50 55	45 50 55	45 50 55	45 50 55	45 50 55	45 50 55	45 50 55
Median type (L/T)	N Y	N Y	N Y	N Y	N Y	N Y	N Y	N Y	N Y	N Y	N Y	N Y
Left turn lanes (L/T)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Paved shoulder/bicycle lanes (L/T)												
Outside lane width (ft)												
Pavement condition (L/T)												
Sidewalk (L/T)												
Sidewalk/roadway separation (ft)												
Sidewalk/roadway protective barrier (L/T)												
Obstacle to bus stop (L/T)												
TRAFFIC CHARACTERISTICS												
Planning analysis hour factor (K)	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095
Directional distribution factor (D)	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
Peak hour factor (PHF)	0.925	0.925	0.925	0.925	0.925	0.925	0.925	0.925	0.925	0.925	0.925	0.925
Base saturation flow rate (ppph)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Heavy vehicle percent	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Local adjustment factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
% turn from exclusive turn lanes	12	12	12	12	12	12	12	12	12	12	12	12
Bus stop of service												
CONTROL CHARACTERISTICS												
Signalized intersection per mile	1.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Arrival type (L/T)	3	3	3	3	3	3	3	3	3	3	3	3
Signal type (L/T)	120	120	120	120	120	120	120	120	120	120	120	120
Cycle length (s)	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44
Effective green ratio (g/C)												

LEVEL OF SERVICE THRESHOLDS

Level of Service	Freeways				Highways				State Two-Way Arterials				Non-State Roadways				Bicycle	Pedestrian	Buses per hr.				
	Class III		Class IV		Two-Lane		Multilane		Class I		Class II		Class III		Class IV					Major City/County		Other Signalized	
	v/c	Density	v/c	Density	% PFS	v/c	Density	ATIS	ATIS	ATIS	ATIS	ATIS	ATIS	ATIS	ATIS	ATIS				ATIS	Control Delay	Control Delay	
A	< 0.32	< 11	< 0.29	< 11	< 0.29	< 11	< 0.29	< 11	< 42 mph	> 35 mph	> 30 mph	> 25 mph	> 35 mph	> 35 mph	> 35 mph	> 35 mph	> 35 mph	> 20 sec	< 10 sec	< 1.5	< 1.5	> 6	
B	< 0.33	< 16	< 0.33	< 18	> 0.833	< 18	> 0.833	< 18	> 24 mph	> 28 mph	> 24 mph	> 19 mph	> 28 mph	> 28 mph	> 28 mph	> 28 mph	> 28 mph	< 20 sec	< 20 sec	< 2.5	< 2.5	> 4	
C	< 0.34	< 26	< 0.34	< 26	> 0.833	< 26	> 0.833	< 26	> 21 mph	> 24 mph	> 18 mph	> 13 mph	> 21 mph	> 21 mph	> 21 mph	> 21 mph	> 21 mph	< 33 sec	< 33 sec	< 3.5	< 3.5	> 2	
D	< 0.35	< 35	< 0.35	< 35	> 0.833	< 35	> 0.833	< 35	> 21 mph	> 17 mph	> 14 mph	> 11 mph	> 21 mph	> 17 mph	> 17 mph	> 17 mph	> 17 mph	< 53 sec	< 53 sec	< 4.5	< 4.5	> 2	
E	< 0.40	< 45	< 0.40	< 45	> 0.833	< 45	> 0.833	< 45	> 16 mph	> 13 mph	> 10 mph	> 7 mph	> 16 mph	> 13 mph	> 13 mph	> 13 mph	> 13 mph	< 80 sec	< 80 sec	< 5.5	< 5.5	> 1	
F	> 0.40	> 45	> 0.40	> 45	> 0.833	> 45	> 0.833	> 45	< 16 mph	< 13 mph	< 10 mph	< 7 mph	< 16 mph	< 13 mph	< 13 mph	< 13 mph	< 13 mph	> 80 sec	> 80 sec	> 5.5	> 5.5	< 1	

**TABLE 4 - 2**  
**GENERALIZED ANNUAL AVERAGE DAILY VOLUMES FOR FLORIDA'S**  
**AREAS TRANSITIONING INTO URBANIZED AREAS OR**  
**AREAS OVER 5,000 NOT IN URBANIZED AREAS\***

UNINTERRUPTED FLOW HIGHWAYS						FREEWAYS						
Level of Service						Level of Service						
Lanes	Divided	A	B	C	D	E	Lanes	A	B	C	D	E
2	Undivided	2,100	6,900	12,900	18,200	24,900	4	23,500	38,700	52,500	62,200	69,100
4	Divided	18,600	30,200	43,600	56,500	64,200	6	36,400	59,800	81,100	96,000	106,700
6	Divided	27,900	45,200	65,500	84,700	96,200	8	49,100	80,900	109,600	129,800	144,400
							10	61,800	101,800	138,400	163,800	182,000

STATE TWO-WAY ARTERIALS						BICYCLE MODE						
Class I (>0.00 to 1.99 signalized intersections per mile)						(Note: Level of service for the bicycle mode in this table is based on roadway geometrics at 40 mph posted speed and traffic conditions, not number of bicyclists using the facility.) (Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)						
Level of Service						Level of Service						
Lanes	Divided	A	B	C	D	E	Paved Shoulder/ Bicycle Lane Coverage	A	B	C	D	E
2	Undivided	**	4,000	13,100	15,500	16,300	0-49%	**	1,900	3,300	13,600	>13,600
4	Divided	4,600	27,900	32,800	34,200	***	50-84%	**	2,500	4,000	>4,000	***
6	Divided	6,900	42,800	49,300	51,400	***	85-100%	3,200	7,100	>7,100	***	***
Class II (2.00 to 4.50 signalized intersections per mile)						PEDESTRIAN MODE						
Class III (more than 4.5 signalized intersections per mile)						(Note: Level of service for the pedestrian mode in this table is based on roadway geometric at 40 mph posted speed and traffic conditions, not number of pedestrians using the facility.) (Multiply motorized vehicle volumes shown by number of directional roadway lanes to determine two-way maximum service volumes.)						
Level of Service						Level of Service						
Lanes	Divided	A	B	C	D	E	% Sidewalk Coverage	A	B	C	D	E
2	Undivided	**	**	5,000	11,800	14,600	0-49%	**	**	**	6,300	15,400
4	Divided	**	**	11,700	27,200	30,800	50-84%	**	**	**	9,800	18,800
6	Divided	**	**	18,400	42,100	46,300	85-100%	**	2,200	11,200	>11,200	***

NON-STATE ROADWAYS						ARTERIAL/NON-STATE ROADWAY ADJUSTMENTS					
Major City/County Roadways						DIVIDED/UNDIVIDED					
Level of Service						Level of Service					
Lanes	Divided	A	B	C	D	E	Lanes	Median	Left Turn Lanes	Adjustment Factors	
2	Undivided	**	**	7,000	13,600	14,600	2	Divided	Yes	+5%	
4	Divided	**	**	16,400	29,300	30,900	2	Undivided	No	-20%	
6	Divided	**	**	25,700	44,100	46,400	Multi	Undivided	Yes	-5%	
Other Signalized Roadways (signalized intersection analysis)							Multi	Undivided	No	-25%	
Level of Service						ONE-WAY FACILITIES					
Lanes	Divided	A	B	C	D	E	Decrease corresponding two-directional volumes in this table by 40% to obtain the equivalent one directional volume for one-way facilities.				
2	Undivided	**	**	4,400	9,400	12,000					
4	Divided	**	**	10,300	20,200	24,000					

Source:	Florida Department of Transportation	02/22/02
	Systems Planning Office	
	605 Suwannee Street, MS 19	
	Tallahassee, FL 32399-0450	
	<a href="http://www11.myflorida.com/planning/systems/sm/los/default.htm">http://www11.myflorida.com/planning/systems/sm/los/default.htm</a>	

\*This table does not constitute a standard and should be used only for general planning applications. The computer models from which this table is derived should be used for more specific planning applications. The table and deriving computer models should not be used for corridor or intersection design, where more refined techniques exist. Values shown are two-way annual average daily volumes (based on K<sub>100</sub> factors) for levels of service and are for the automobile/truck modes unless specifically stated. Level of service letter grade thresholds are probably not comparable across modes and, therefore, cross modal comparisons should be made with caution. Furthermore, combining levels of service of different modes into one overall roadway level of service is not recommended. The table's input value defaults and level of service criteria appear on the following page. Calculations are based on planning applications of the Highway Capacity Manual, Bicycle LOS Model, and Pedestrian LOS Model, respectively for the automobile/truck, bicycle and pedestrian modes.

\*\*Cannot be achieved using table input value defaults.

\*\*\*Not applicable for the level of service letter grade. For automobile/truck modes, volumes greater than level of service D become F because intersection capacities have been reached. For bicycle and pedestrian modes, the level of service letter grade (including F) is not achievable, because there is no maximum vehicle volume threshold using table input value defaults.

TABLE 4 - 2 (continued)  
GENERALIZED ANNUAL AVERAGE DAILY VOLUMES FOR FLORIDA'S  
AREAS TRANSITIONING INTO URBANIZED AREAS OR AREAS OVER 5,000 NOT IN URBANIZED AREAS

INPUT VALUE ASSUMPTIONS

UNINTERRUPTED FLOW FACILITIES	
Roadway Characteristics	Freeway Class II
Number of through lanes	4 - 10
Posted speed (mph)	50
Free flow speed (mph)	55
Basic segment length (mi)	3
Interchange spacing per mile	4
Median (ft)	n
Left turn lanes (L/T)	1
Turns (L/T)	1
% no passing	60
Passing lanes (L/T)	n
Planning analysis hour factor (K)	0.096
Directional distribution factor (D)	0.55
Peak hour factor (PHF)	0.910
Base capacity (pcphpl)	1700
Heavy vehicle percent	4.0
Local adjustment factor	0.95

INTERRUPTED FLOW FACILITIES									
Roadway Characteristics	State Arterials			Class III			Non-State Roadways		
	Class I	Class II	Class III	Class I	Class II	Class III	Major City/County	Other Signalized	Pedestrian
Number of through lanes	2	4 - 6	2	2	4 - 6	2	2	4 - 6	Class II
Posted speed (mph)	45	50	45	35	35	40	40	40	Class II
Free flow speed (mph)	50	55	50	40	40	45	45	45	Class II
Median type (L/T)	n	n	n	n	n	n	n	n	Class II
Left turn lanes (L/T)	1	1	1	1	1	1	1	1	Class II
Turns (L/T)	1	1	1	1	1	1	1	1	Class II
% no passing	60	60	60	60	60	60	60	60	Class II
Passing lanes (L/T)	n	n	n	n	n	n	n	n	Class II
Planning analysis hour factor (K)	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	Class II
Directional distribution factor (D)	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	Class II
Peak hour factor (PHF)	0.910	0.910	0.910	0.910	0.910	0.910	0.910	0.910	Class II
Base capacity (pcphpl)	1900	1900	1900	1900	1900	1900	1900	1900	Class II
Heavy vehicle percent	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	Class II
Local adjustment factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	Class II
% turns from exclusive turn lanes	12	12	12	12	12	12	12	12	Class II
Signalized intersection per mile	1.5	1.0	3.0	3.0	5.0	3.0	3.0	3.0	Class II
Arrival type (L/T)	3	4	4	4	4	4	4	4	Class II
Signal type (L/T)	n	n	n	n	n	n	n	n	Class II
Cycle length (C)	120	120	120	120	120	120	120	120	Class II
Effective green ratio (g/C)	0.44	0.44	0.44	0.44	0.44	0.44	0.41	0.31	0.44

LEVEL OF SERVICE THRESHOLDS

Level of Service	Freeway			Highway			State Two-Way Arterials			Non-State Roadways			Bicycle		Pedestrian	
	Class II	Class I	Class III	Class I	Class II	Class III	Class I	Class II	Class III	Major City/County	Other Signalized	Control Delay	Score	Score	Score	Score
A	< 0.34	< 0.17	< 11	< 0.29	< 0.18	< 18	< 0.29	< 0.18	< 18	> 35 mph	> 35 mph	< 10 sec	< 1.5	< 1.5	< 1.5	< 1.5
B	< 0.56	< 0.35	< 18	< 0.47	< 0.35	< 26	< 0.47	< 0.35	< 26	> 28 mph	> 28 mph	< 20 sec	< 2.5	< 2.5	< 2.5	< 2.5
C	< 0.76	< 0.50	< 26	< 0.68	< 0.50	< 35	< 0.68	< 0.50	< 35	> 22 mph	> 22 mph	< 35 sec	< 3.5	< 3.5	< 3.5	< 3.5
D	< 0.90	< 0.67	< 35	< 0.88	< 0.67	< 41	< 0.88	< 0.67	< 41	> 17 mph	> 17 mph	< 55 sec	< 4.5	< 4.5	< 4.5	< 4.5
E	< 1.00	< 0.83	< 45	< 1.00	< 0.83	< 41	< 1.00	< 0.83	< 41	> 13 mph	> 13 mph	< 80 sec	< 5.5	< 5.5	< 5.5	< 5.5
F	> 1.00	> 0.83	> 45	> 1.00	> 0.83	> 41	> 1.00	> 0.83	> 41	> 13 mph	> 13 mph	> 80 sec	> 5.5	> 5.5	> 5.5	> 5.5

v/o = Demand to Capacity Ratio

% FFS = Percent Free Flow Speed

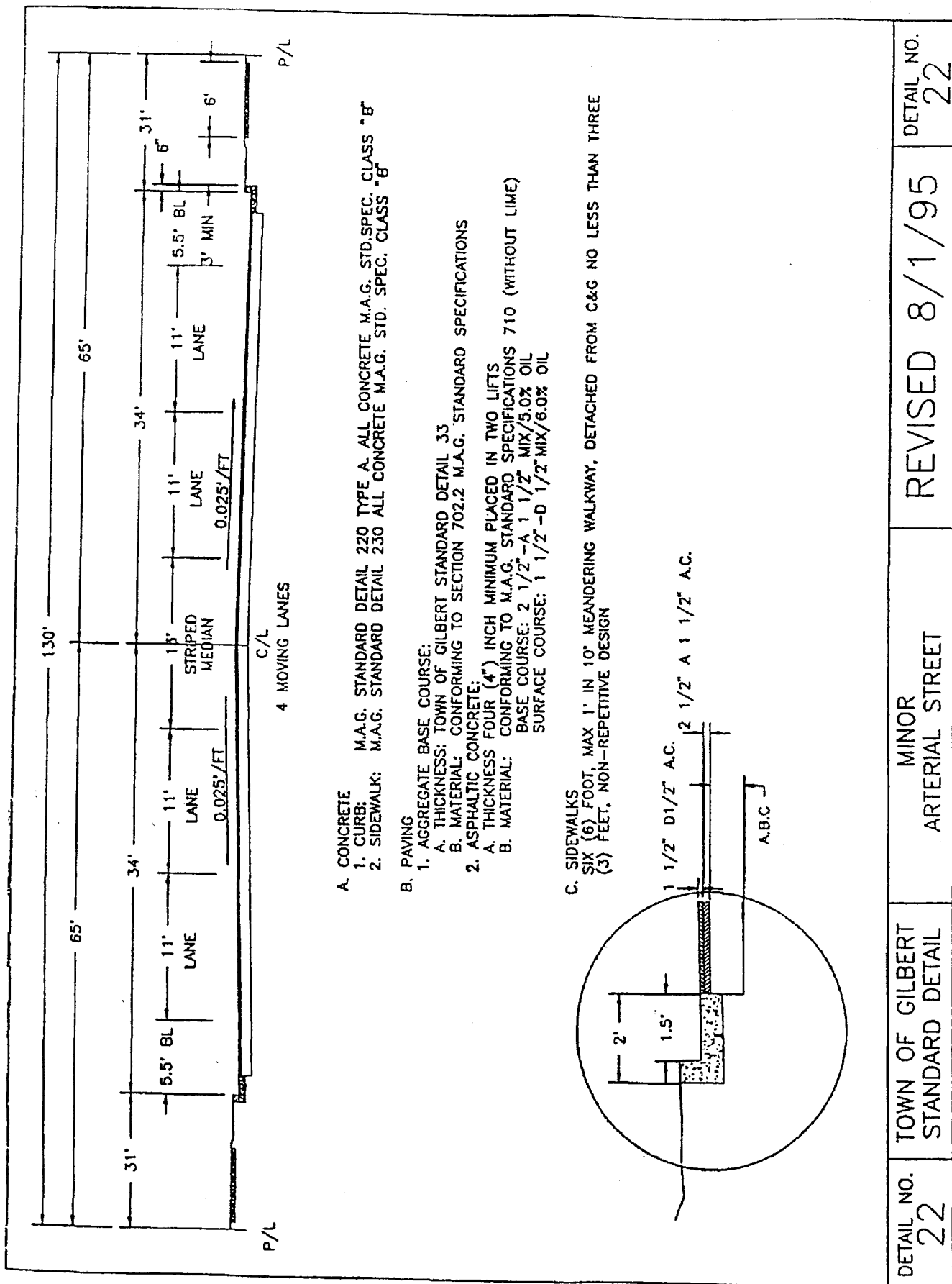
ATS = Average Travel Speed

**APPENDIX F:**

**TOWN OF GILBERT STANDARD CROSS SECTIONS**

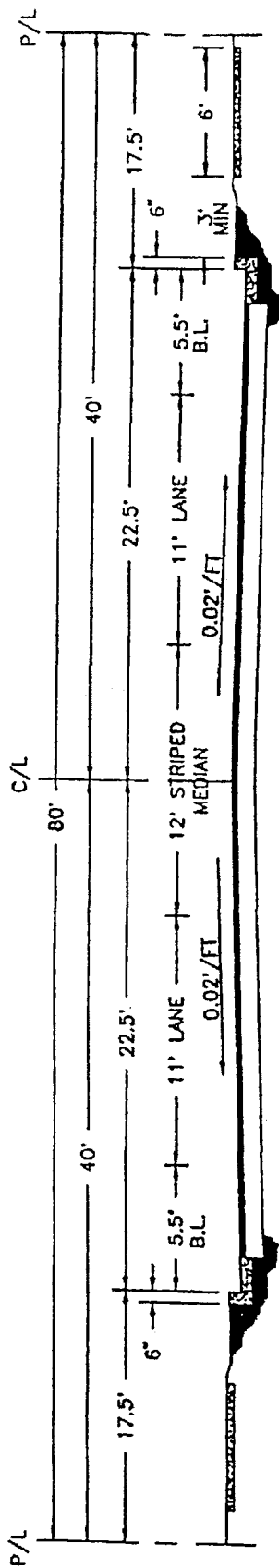






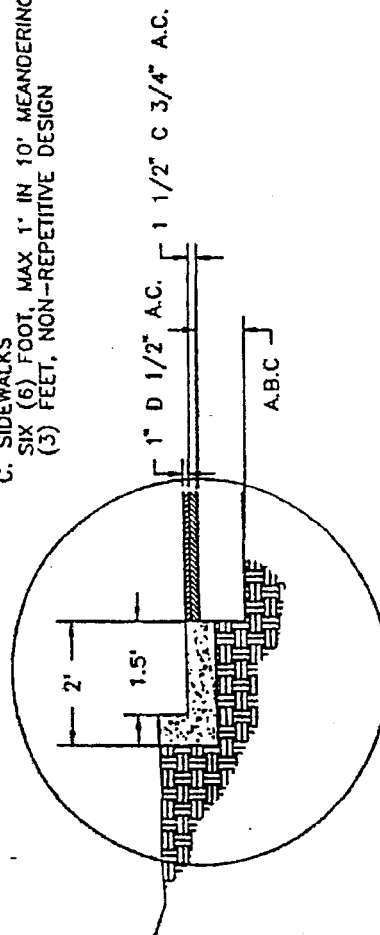
- A. CONCRETE  
 1. CURB: M.A.G. STANDARD DETAIL 220 TYPE A. ALL CONCRETE M.A.G. STD. SPEC. CLASS "B"  
 2. SIDEWALK: M.A.G. STANDARD DETAIL 230 ALL CONCRETE M.A.G. STD. SPEC. CLASS "B"
- B. PAVING  
 1. AGGREGATE BASE COURSE:  
 A. THICKNESS: TOWN OF GILBERT STANDARD DETAIL 33  
 B. MATERIAL: CONFORMING TO SECTION 702.2 M.A.G. STANDARD SPECIFICATIONS  
 2. ASPHALTIC CONCRETE:  
 A. THICKNESS FOUR (4") INCH MINIMUM PLACED IN TWO LIFTS  
 B. MATERIAL: CONFORMING TO M.A.G. STANDARD SPECIFICATIONS 710 (WITHOUT LIME)  
 BASE COURSE: 2 1/2" - A 1 1/2" MIX/5.0% OIL  
 SURFACE COURSE: 1 1/2" - D 1 1/2" MIX/6.0% OIL
- C. SIDEWALKS  
 SIX (6) FOOT, MAX 1' IN 10' MEANDERING WALKWAY, DETACHED FROM C&G NO LESS THAN THREE (3) FEET, NON-REPETITIVE DESIGN

DETAIL NO. 22	TOWN OF GILBERT STANDARD DETAIL	MINOR ARTERIAL STREET	REVISED 8/1/95	DETAIL NO. 22
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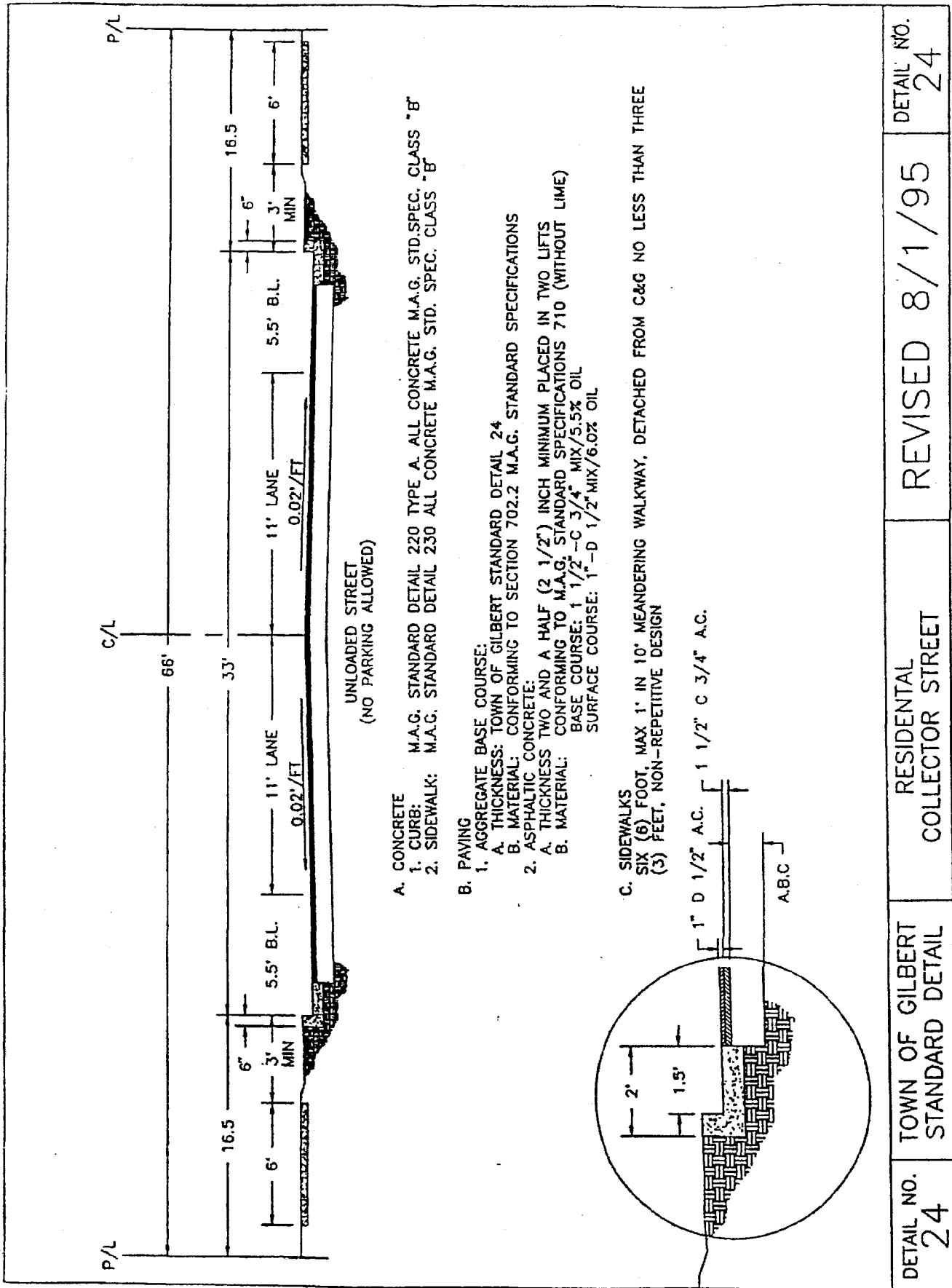


- A. CONCRETE**  
 1. CURB: M.A.G. STANDARD DETAIL 220 TYPE A. ALL CONCRETE M.A.G. STD. SPEC. CLASS "B"  
 2. SIDEWALK: M.A.G. STANDARD DETAIL 230 ALL CONCRETE M.A.G. STD. SPEC. CLASS "B"
- B. PAVING**  
 1. AGGREGATE BASE COURSE:  
   A. THICKNESS: TOWN OF GILBERT STANDARD DETAIL 34  
   B. MATERIAL: CONFORMING TO SECTION 702.2 M.A.G. STANDARD SPECIFICATIONS  
 2. ASPHALTIC CONCRETE:  
   A. THICKNESS TWO AND A HALF (2 1/2") INCH MINIMUM PLACED IN TWO LIFTS  
   B. MATERIAL: CONFORMING TO M.A.G. STANDARD SPECIFICATIONS 710 (WITHOUT LIME)  
   BASE COURSE: 1 1/2" - C 3/4" MIX/5.5% OIL  
   SURFACE COURSE: 1" - D 1/2" MIX/6.0% OIL

- C. SIDEWALKS**  
 SIX (6) FOOT, MAX 1' IN 10' MEANDERING WALKWAY, DETACHED FROM C&G NO LESS THAN THREE (3) FEET, NON-REPETITIVE DESIGN



DETAIL NO. 23	TOWN OF GILBERT STANDARD DETAIL	MAJOR COLLECTOR STREET	REVISED 8/1/95	DETAIL NO. 23
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**APPENDIX G:**

**TOWN OF GILBERT COMMENTS AND RESPONSE  
MEMORANDUM**



3707 North 7<sup>th</sup> Street • Suite 235 • Phoenix • AZ • 85014

Phone: 602 • 277 • 4224 Fax: 602 • 277 • 4228 e-mail: task@taskeng.net

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November 7, 2006

**MEMORANDUM**

TO: Rick A, Town of Gilbert

FROM: Ken Howell, P.E.

**RE: Response to Comments on Cooley Station Village Center & Business Park**

The following summarizes responses to each comment made by the Town of Gilbert dated September 15, 2006, concerning the Cooley Station Traffic Impact Study, dated August 16, 2006. These responses have been incorporated into this final revised traffic impact study. Each comment is listed verbatim followed by a summary of how the comment is addressed or is incorporated into the final report.

1. *Report should indicate that trip generation, trip distribution and level of service are to be performed in accordance with the Institute of Transportation Engineers Trip Generation Manual 7<sup>th</sup> Edition and the Maricopa Association of Governments publications. The traffic stop sign and signal warrant analysis are to be performed in accordance with the Arizona Department of Transportation policies and the Manual on Traffic Control Devices.*

The source for trip rates in this study were *Trip Generation, Seventh Edition, 2003*, and the *Trip Generation Handbook, 2<sup>nd</sup> Edition, June 2004*, published by the Institute of Transportation Engineers (ITE). The site trips were distributed proportionally to the sum of Year 2020 population and employment forecasts within ten miles of the center of the site. The projections used for the trip distribution were obtained from Year 2020 Population and Employment projections by the Maricopa Association of Government (MAG).

For Year 2025, critical intersections were analyzed using the methodologies presented in the *Highway Capacity Manual, 2000 Edition* and were evaluated using the HCS+ software. This is a standard software package used analyze both signalized and STOP sign controlled intersections. According to the information provided by McTrans, the developers of HCS+,

“The Highway Capacity Software (HCS) is developed and maintained by McTrans as part of its user-supported software maintenance as a faithful implementation of the Highway Capacity Manual (HCM) procedures... The Highway Capacity Manual (© 2000 National Academy of Sciences) is the basis for all capacity and level of service computations included in HCS.... The Manual on Uniform Traffic

Control Devices (MUTCD) is the basis for all signal warrant computations included in HCS."

For Year 2015, generalized average daily traffic (ADT) analysis was completed to determine the estimated number of lanes and level of service. These daily service volumes were taken from Table 4-2 of *Quality/Level of Service Handbook*, prepared by State of Florida Department of Transportation, 2002. The Transportation Impact Analysis for Site Development, An ITE Proposed Recommended Practice, refers to the Florida Department of Transportation method as an example of a planning level analysis for determining level of service.

The Maricopa Department of Transportation (MCDOT) procedures for determining if traffic signals are warranted on the basis of estimates of average daily traffic (ADT) were used. These procedures convert the major eight hour volume warrant of the *Manual on Uniform Traffic Control Devices* (MUTCD) into estimates of daily traffic, as appropriate for comparison with the daily traffic forecasts prepared for this report. The procedures and recommendations are discussed in the SIGNAL WARRANTS section that has been added to the revised report.

All procedures used in this report are standard, state of the practice procedures for the completion of traffic impact studies.

2. *Page 3, 2<sup>nd</sup> line, the phrase "located south of Recker" should state "located south of Ray Road".*

This has been changed in the revised report.

3. *Page 16, figures 5-1 and 5-2, turning movement counts are missing from turning movement diagrams A,B,C,D,H,I,N and S. In addition figures 5-1 and 5-2 do not identify the year for the Peak Hour Study Area traffic.*

The study area traffic identified on Figures 5-1 and 5-2 are for full buildout of the site. This is used for both the Year 2015 and Year 2025 total traffic volumes, as this represent the ultimate amount of traffic generated by the development. Based on this, a year is not indicated on the Study Area Traffic graphic.

The turning movements on Figures 5-1 and 5-2 are for traffic traveling to and from the developments located in the study area. Traffic traveling through the study area that are not traveling to a site within the study area are not included in these turning movements, but are reflected in background traffic volumes. Therefore, some turns may be zero at some intersections in Figures 5-1 and 5-2. This issue is discussed further in response to Comment 4 below.

4. *Page 25, figure 11-1, turning movement counts are missing from turning movement diagrams B,C,D,H and I.*

De minimus turns were added to the total traffic in locations where low (or no) turning movements were projected. The intersections in diagrams B, C, D, H, and I on Figure 11-1 have been adjusted to add these de minimus turns. This represents minor turning movements, of 5 per hour, or 2 per hour for low volume intersections.

5. *Page 31, under Traffic Signals, Williams Field Road and access 1 and Williams Field and access 2 are identified as being recommended for traffic signals, however, they are not identified on page 27, figure 12 where all other signal recommendations are identified.*

Traffic signals are recommended at Williams Field Road/Access 1 and Williams Field Road/Access 2 for Year 2025. Year 2025 recommendations are shown on Figure 13-1 and 13-2. Year 2015 recommendations are shown on Figure 12.

The SIGNAL WARRANT and RECOMMENDATION sections have been revised to clarify the recommendation year for the signals.

6. *Page 31, although this page identifies where right-turn deceleration lanes should be provided it does not address where dual left-turn lanes may need to be provided.*

Dual left turn lanes have not been recommended for any intersections analyzed in this report. The graphics have been updated to reflect this.

7. *Page 32, under the heading Year 2015 conditions, the last bullet states that warranted traffic signals for 2015 are shown on figure 8, however, it is shown on figure 12.*

This has been changed in the revised report.

8. *Page 32, under Year 2025 conditions the last bullet states that Power Road and Ray Road are recommended for 6 lanes for the year 2025. The study should indicate that this is per the Towns standard since the study data may not support the 6 lanes.*

This has been added to the above referenced recommendation in the revised report.

9. *Page 33, under traffic signals recommended locations, please see comments in 5 above.*

The SIGNAL WARRANT and RECOMMENDATION sections have been revised to clarify the recommendation year for signals.

I hope this addresses the remaining issues regarding this report. If there are any further comments, or if I can be of any further assistance, please contact me at (602) 277-4224, or khowell@taskeng.net. Thank you.



# TOWN OF GILBERT - TRAFFIC ENGINEERING REVIEW COMMENT SHEET

**Project Name:** Cooley Station Village Center & Business Park  
**Location:** Williams Field and Recker  
**Consultant:**  
**Plans Sealed By:**

**Date:** 9-15-2006  
**Reviewer:** Rick A  
**Phone No.:** 6841  
**Review No.:**

**Signature of  
Engineer/Architect**

Sheet Number	Summary of Redline Comments	Consultant Reply
	<p style="text-align: center;">Traffic Impact Study</p> <ol style="list-style-type: none"> <li>Report should indicate that trip generation, trip distribution and level of service are to be performed in accordance with the Institute of Transportation Engineers Trip Generation Manual 7<sup>th</sup> Edition and the Maricopa Association of Governments publications. The traffic stop sign and signal warrant analysis are to be performed in accordance with the Arizona Department of Transportation policies and the Manual on Traffic Control Devices.</li> <li>Page 3, 2<sup>nd</sup> line, the phrase "located south of Recker" should state "located south of Ray Road".</li> <li>Page 16, figures 5-1 and 5-2, turning movement counts are missing from turning movement diagrams A,B,C,D,H,I,N and S. In addition figures 5-1 and 5-2 do not identify the year for the Peak Hour Study Area traffic.</li> <li>Page 25, figure 11-1, turning movement counts are missing from turning movement diagrams B,C,D,H and I.</li> <li>Page 31, under Traffic Signals, Williams Field Road and access 1 and Williams Field and access 2 are identified as being recommended for traffic signals, however, they are not identified on page 27, figure 12 where all other signal recommendations are identified.</li> <li>Page 31, although this page identifies where right-turn deceleration lanes should be provided it does not address where dual left-turn lanes may need to be provided.</li> <li>Page 32, under the heading Year 2015 conditions, the last bullet states that warranted traffic signals for 2015 are shown on figure 8, however, it is shown on figure 12.</li> <li>Page 32, under Year 2025 conditions the last bullet states that Power Road and Ray Road are recommended for 6 lanes for the year 2025. The study should indicate that this is per the Towns standard since the study data may not support the 6 lanes.</li> <li>Page 33, under traffic signals recommended locations, please see comments in 5 above.</li> </ol>	

**APPENDIX H:**  
**SIGNAL WARRANT PROCEDURES**

ENGINEERING DIVISION

TRAFFIC ENGINEERING BRANCH

MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION

Policy/Procedure Guideline

SECTION 4: Traffic Signals

SUBJECT 4.6: Evaluation of Future Traffic Signal Needs

EFFECTIVE DATE: April 30, 1997

PARAGRAPH:

1. Purpose
2. Description
3. Exhibits
4. Background
5. Authorization
6. References
7. Attachments

1. PURPOSE:

This PPG sets forth the procedure and criteria to be used in evaluating future traffic signal needs on projects in the Capital Improvement Project (CIP) program, or in any studies undertaken by or submitted to MCDOT.

2. DESCRIPTION:

ADT volume warrant. This warrant applies at a new intersection, an intersection revised by a proposed roadway construction project, or at the driveway of a new commercial or residential development, and is met when the following requirement is satisfied:

The estimated ADT on the major street and on the higher volume minor street or driveway approach to the intersection equals or exceeds the values in the following table:

1 **COMMISSIONERS**

2 KRISTIN K. MAYES, CHAIRMAN

3 GARY PIERCE

4 PAUL NEWMAN

5 SANDRA D. KENNEDY

6 BOB STUMP

7 **BEFORE THE ARIZONA CORPORATION COMMISSION**

8 IN THE MATTER OF THE APPLICATION  
9 OF THE TOWN OF GILBERT TO  
10 UPGRADE A CROSSING OF THE UNION  
11 PACIFIC RAILROAD AT  
12 WILLIAMSFIELD ROAD IN THE TOWN  
13 OF GILBERT, MARICOPA COUNTY,  
14 ARIZONA, AAR/DOT NO. 753-711-Y.

DOCKET NO. RR-03639A-09-0430

15 **NOTICE OF FILING AFFIDAVIT OF  
16 PUBLICATION**

17 The Town of Gilbert ("Gilbert"), by and through undersigned counsel, hereby  
18 files its Notice of Affidavit of Publication as required by Procedural Order dated September  
19 16, 2009. A copy of the Affidavit is attached hereto. Gilbert also confirms that it has  
20 provided a copy of the Application and the September 16, 2009 Procedural Order to  
21 surrounding adjacent property owners via certified mail.

22 DATED this 27th day of October, 2009.

23 CURTIS, GOODWIN, SULLIVAN,  
24 UDALL & SCHWAB, P.L.C.

25 By: 

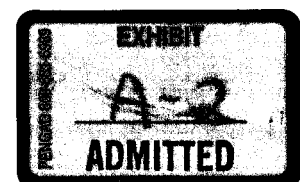
William P. Sullivan

Kelly Y. Schwab

501 East Thomas Road

Phoenix, Arizona 85012-3205

Attorneys for the Town of Gilbert



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Docket Control  
Arizona Corporation Commission  
1200 West Washington  
Phoenix, Arizona 85007

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Legal Division  
Arizona Corporation Commission  
1200 West Washington Street  
Phoenix, Arizona 85007

Brian Lehman, Chief  
Railroad Safety Section of the Safety Division  
Arizona Corporation Commission  
1200 West Washington Street  
Phoenix, Arizona 85007

Aziz Amam, Manger of Special Projects  
Union Pacific Railroad Company  
2073 East Jade Drive  
Chandler, Arizona 85286

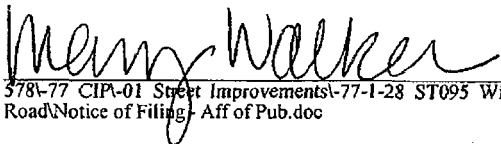
Anthony J. Hancock  
Terrance L. Sims  
Beaugureau, Zukowski & Hancock, PC  
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Phoenix, Arizona 85004  
Attorneys for Union Pacific Railroad Company

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State Railroad Liaison  
Arizona Department of Transportation  
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6 4561 East McDowell Road  
7 Phoenix, Arizona 85008

6 Kelly Roy, Utility Project Coordinator  
7 Maricopa County Department of Transportation  
8 2901 West Durango Street  
9 Phoenix, Arizona 85009

10 

11 578-77 CIP-01 Street Improvements-77-1-28 ST095 Williams Field Rd-UPRR to Power\ACC Proceeding\RR-03639A-09-0430 - Williamsfield  
12 Road\Notice of Filing- Aff of Pub.doc

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IN THE MATTER OF THE APPLICATION OF THE TOWN OF GILBERT TO UPGRADE A CROSSING OF THE UNION PACIFIC RAILROAD AT WILLIAMS FIELD ROAD IN THE TOWN OF GILBERT, MARICOPA COUNTY, ARIZONA, AAR/DOT NO. 753-711-Y, (DOCKET NO. RR-03639A-09-0430)

On September 4, 2009, the Town of Gilbert ("Town") filed with the Arizona Corporation Commission ("Commission") an application for approval for the Union Pacific Railroad ("Railroad") to upgrade an existing crossing at Williams Field Road in the Town of Gilbert, Maricopa County, Arizona at AAR/DOT No. 753-711-Y.

The application is available for inspection during regular business hours at the offices of the Commission in Phoenix, at 1200 West Washington Street, Phoenix, Arizona, and on the Internet via the Commission website ([www.azcc.gov](http://www.azcc.gov)) using the e-docket function.

The Commission will hold a hearing on this matter commencing on December 14, 2009, at 10:00 a.m. at the Commission's offices, 1200 West Washington Street, Phoenix, Arizona. Public comments will be taken on the first day of the hearing.

The law provides for an open public hearing at which, under appropriate circumstances, interested parties may intervene. Intervention shall be permitted to any person entitled by law to intervene and having a direct and substantial interest in the matter. Persons desiring to intervene must file a written motion to intervene with the Commission, which motion should be sent to Applicant or its counsel and to all parties of record, and which, at the minimum, shall contain the following:

1. The name, address, and telephone number of the proposed intervenor and of any party upon whom service of documents is to be made; if different than the intervenor, the proposed intervenor shall state:
2. A short statement of the proposed intervenor's interest in the proceeding (e.g., a customer of Railroad, a neighboring property owner, a crossing user, etc.);
3. A statement certifying that a copy of the motion to intervene has been mailed to the Applicant or its counsel and to all parties of record in the case.

The granting of motions to intervene shall be governed by A.C.R. 814-3-105, except that all motions to intervene must be filed on or before November 13, 2009. The granting of intervention, among other things, entitles a party to present sworn evidence at hearing and to cross-examine other witnesses. However, failure to intervene will not preclude any customer from appearing at the hearing and making a statement on such customer's own behalf.

If you have any questions about this application, you may contact the applicant Paul Wood at 480-503-6790. If you wish to file written comments on the application or want further information on intervention, you may write the Consumer Services Section of the Commission at 1200 West Washington Street, Phoenix, Arizona 85007, call 602-542-4251 or 1-800-322-7000, or appear at the hearing and make comment.

The Commission does not discriminate on the basis of disability in admission to its public meetings. Persons with a disability may request a reasonable accommodation such as a sign language interpreter, as well as request this document in an alternative format, by contacting Shaylin Bernal, ADA Coordinator, voice phone number 602-542-3931, e-mail [SBernal@azcc.gov](mailto:SBernal@azcc.gov). Requests should be made as early as possible to allow

# AFFIDAVIT OF PUBLICATION

RECEIVED

Paul  
OCT 8 8 2009

FILE COPY

Project No. Stops Williams Field Rd  
File No. Crossing Upgrade

## THE ARIZONA REPUBLIC

STATE OF ARIZONA }  
COUNTY OF MARICOPA } SS.

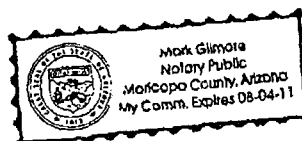
Marilyn Greenwood, being first duly sworn, upon oath deposes and says: That she is a legal advertising representative of the Arizona Business Gazette, a newspaper of general circulation in the county of Maricopa, State of Arizona, published at Phoenix, Arizona, by Phoenix Newspapers Inc., which also publishes The Arizona Republic, and that the copy hereto attached is a true copy of the advertisement published in the said paper on the dates as indicated.

The Arizona Republic

September 23, 2009

*Marilyn Greenwood*

Sworn to before me this  
25<sup>TH</sup> day of  
September A.D. 2009



*Mark Glimora*

Notary Public



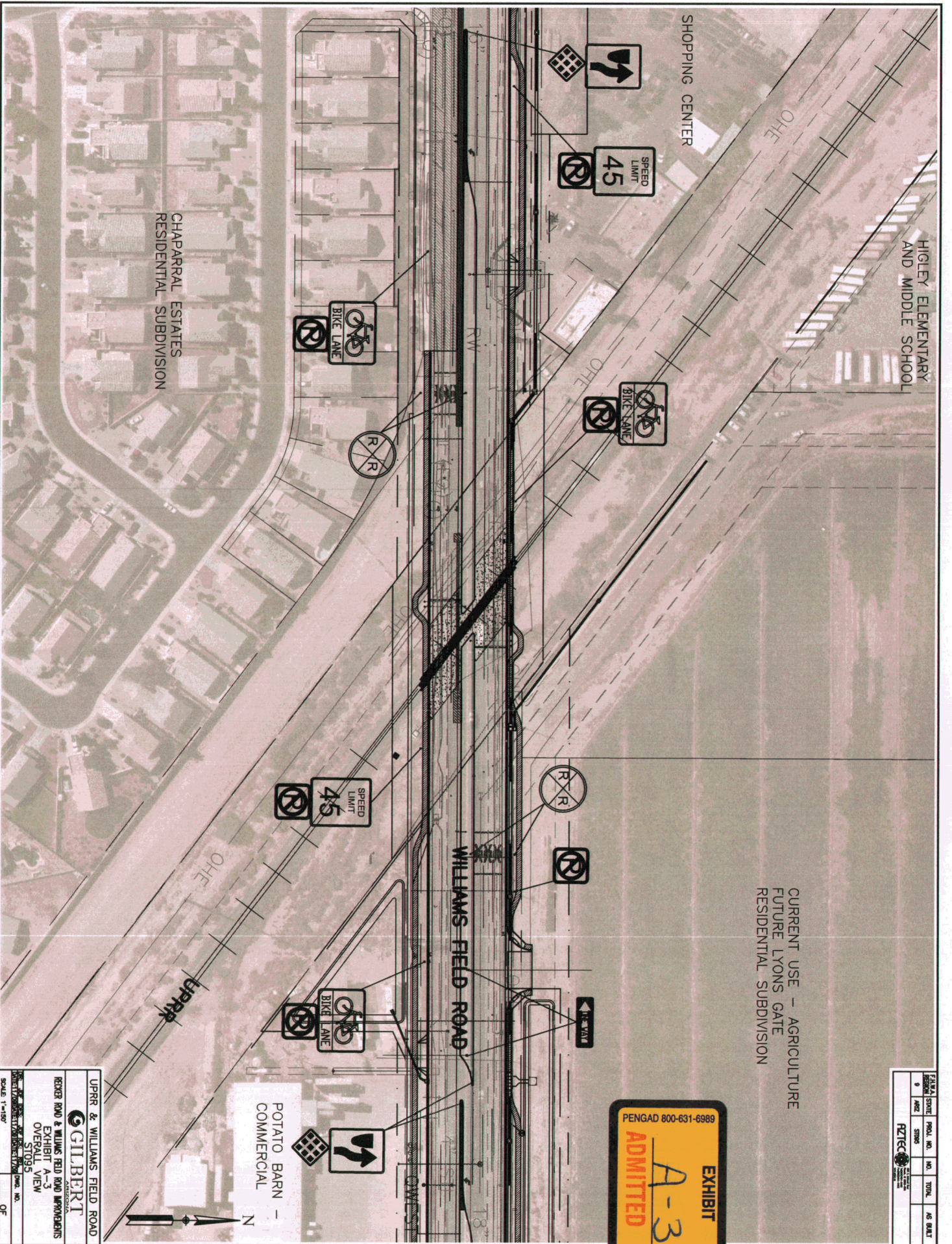
**PENGAD 800-631-6989**


**EXHIBIT**  
A-3  
**ADMITTED**

F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ALAZ	STDS			

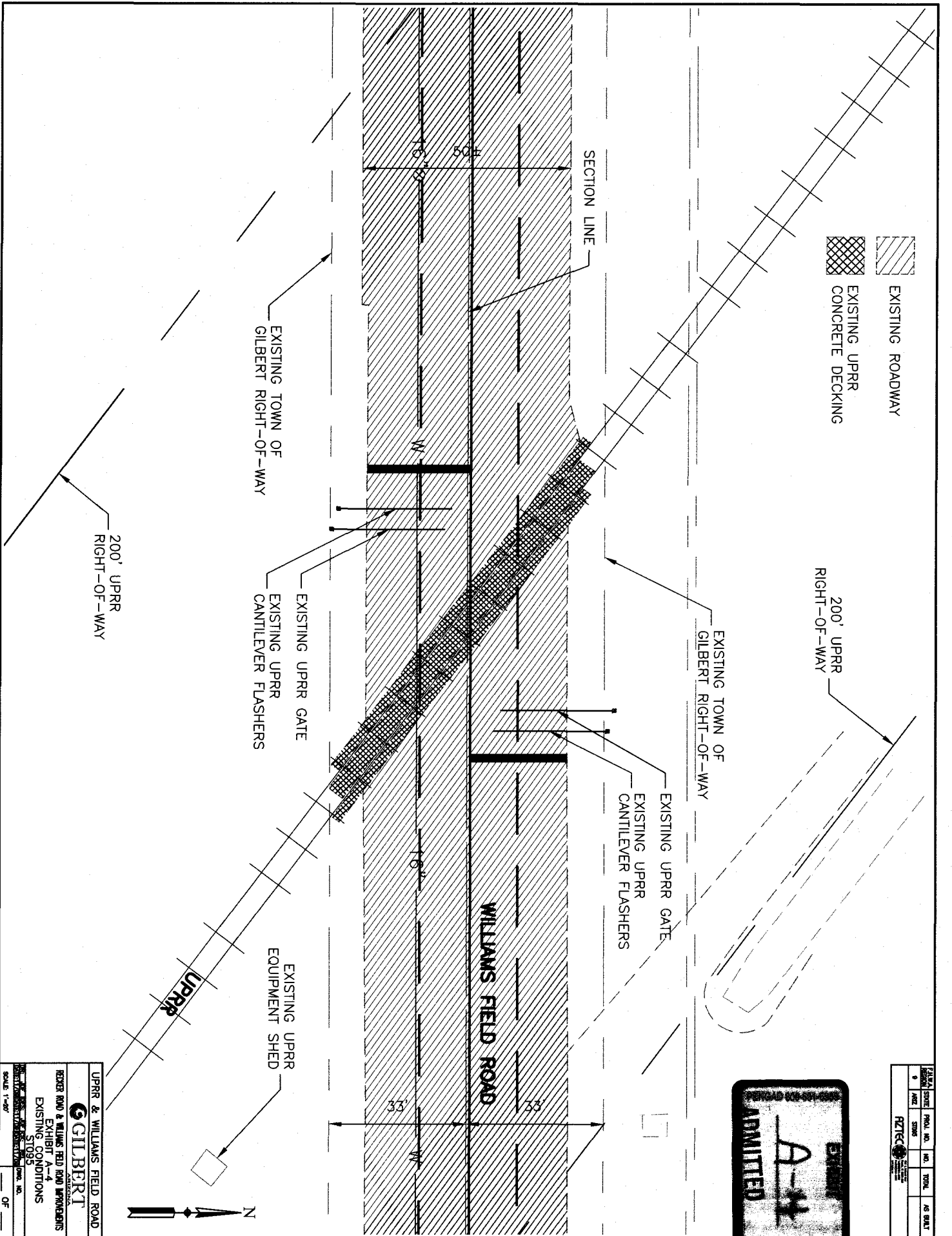
**AZTEC**  Box 1, Santa Fe,  
New Mexico 87501  
(505) 823-1100

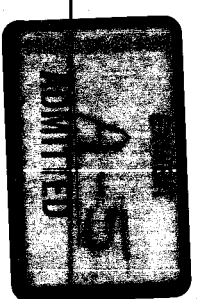
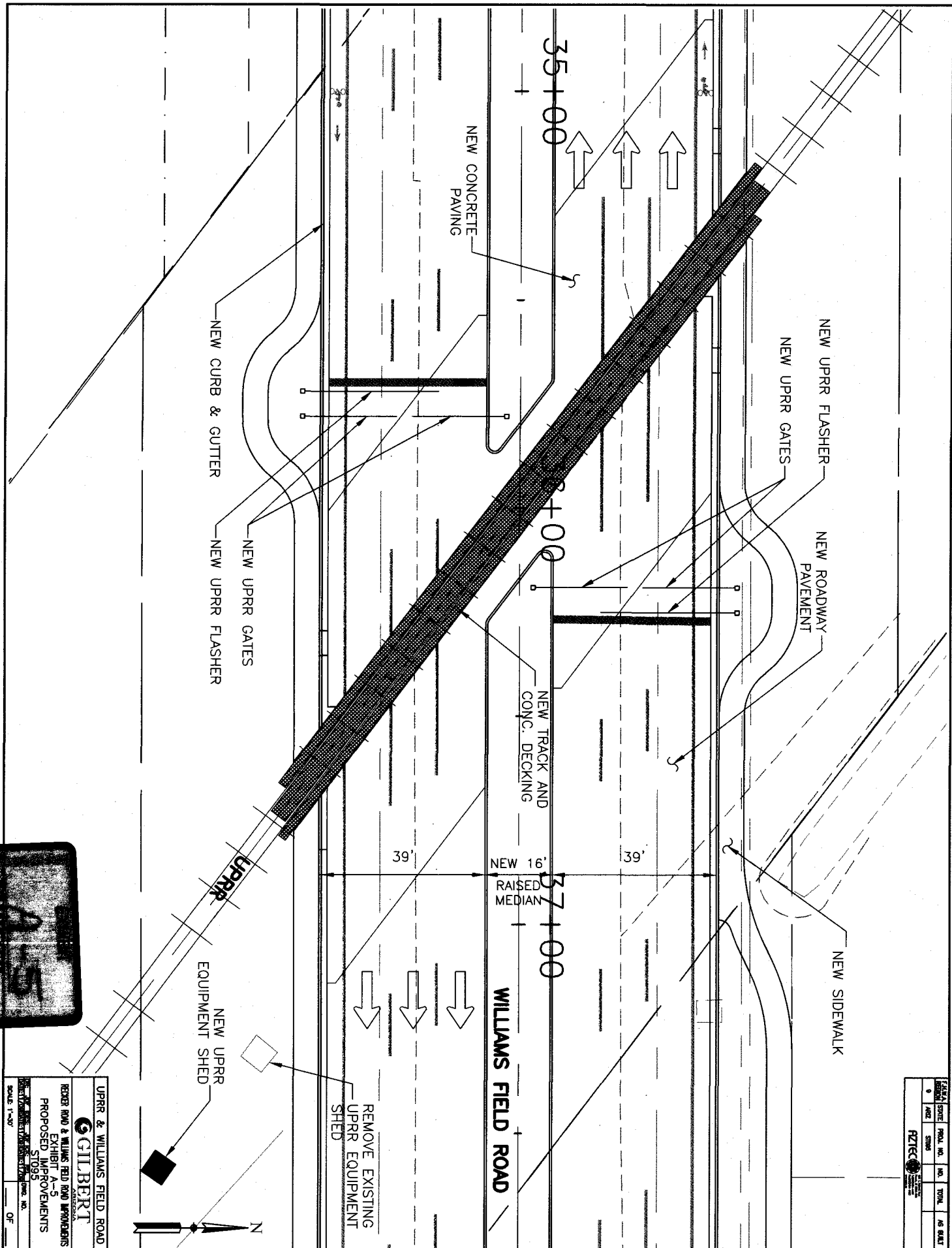
CURRENT USE - AGRICULTURE  
FUTURE LYONS GATE  
RESIDENTIAL SUBDIVISION



UPRR & WILLIAMS FIELD ROAD	 <b>GILBERT</b> <small>ARCHITECTS</small>	RECKER ROAD & WILLIAMS FIELD ROAD IMPROVEMENTS
		EXHIBIT A-3 OVERALL VIEW ST095
DATE: 05/05/2010	PROJECT: 05/05/2010	SCALE: 1"=50'
DATE: 05/05/2010	PROJECT: 05/05/2010	SCALE: 1"=50'







DATE	SCALE	ROLL NO.	NO.	YOUNG	AS BUILT
0	AS SHOWN				
0	AS SHOWN				
0	AS SHOWN				

UPRR & WILLIAMS FIELD ROAD
<b>GILBERT</b>
REXER ROAD & WILLIAMS FIELD ROAD IMPROVEMENTS
EXHIBIT A-5
PROPOSED IMPROVEMENTS
ST095
DATE: 11/11/2009
BY: JLM
CHECKED: JLM
SCALE: 1"=40'
OF

ORIGINAL

STAFF MEMORANDUM



To: THE COMMISSION

RECEIVED

Arizona Corporation Commission

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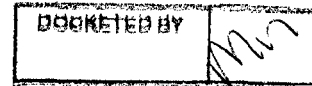
From: Steven M. Olea  
Interim Director  
Safety Division

2009 NOV -5 A 9:43

NOV -5 2009

Date: November 6, 2009

AZ CORP COMMISSION  
DOCKET CONTROL



RE: IN THE MATTER OF THE APPLICATION OF THE TOWN OF GILBERT TO UPGRADE A CROSSING OF THE UNION PACIFIC RAILROAD AT WILLIAMS FIELD ROAD IN THE TOWN OF GILBERT, MARICOPA COUNTY, ARIZONA, DOT NO. 741-831-F.

DOCKET NO. RR-03639A-09-0430

**Background**

On September 4, 2009, the Town of Gilbert ("Town") filed with the Arizona Corporation Commission ("Commission") an application for approval for the Union Pacific Railroad ("Railroad") to upgrade an existing crossing at Williams Field Road in the Town of Gilbert, Maricopa County, Arizona at AAR/DOT No. 741-831-F.

Commission Decision No. 48079 approved the installation of automatic warning devices at Williams Filed Road on July 12, 1977.

On August 27, 2007, Commission Safety Division Railroad Staff ("Staff"), the Railroad, Aztec Engineering (consultants to the Town), and the Town participated in a diagnostic review of the proposed improvements at Williams Field Road. All parties present were in agreement to the proposed improvements at the crossing. The following is a break down of the crossing in this application, including information about the crossing that was provided to Staff by the Town and its contractors.

**Geographical Information**

Gilbert was incorporated on July 6, 1920, and is a relatively new community that has seen tremendous growth during the past two decades. Gilbert has experienced a rapid transition from a historically agriculture-based community to an urban center and suburb in the Phoenix Metropolitan Area. In the last two decades, Gilbert has grown at a pace unparalleled by most communities in the United States, increasing in population from 5,717 in 1980 to over 215,000 in April 2009. As Gilbert has grown, the community has recognized the need to develop a strong, diverse economy while preserving its quality of life.

The rail line in this area runs in a southeast to northwest direction. Williams Field Road is an east to west main arterial through the Town. The general area surrounding the railroad crossing is a mix of residential along with commercial and industrial businesses. (See Attachment "A") Approximately 1.25 miles east of the Williams Field crossing, the Cooley Station Master Planned Community is proposed, however, it is unclear to Staff when

construction of this master planned community will begin. The proposed development will be a mixed residential and commercial development to include single family homes, town homes, apartments and a K-8 school. The commercial site is assumed to have general retail stores.

### **Williams Field Road**

The existing roadway is a four lane road. The proposed project includes widening of the roadway to six lanes with a 16-foot wide raised median. The Town's proposed upgrades will replace the existing incandescent flashing lights, gate mechanisms, bells and detection circuitry, with the latest in industry standards to include: 12-inch LED flashing lights, cantilevers with 12-inch LED flashing lights, median and curb-side gates, bells, and constant warning time circuitry. A new concrete crossing surface will be added, along with replacing any impacted pavement markings. The proposed measures are consistent with safety measures employed at similar at-grade crossings in the state. The estimated cost of the proposed railroad crossing upgrade is \$1,138,683. The Town is paying for the entire cost of the crossing improvements.

Traffic data for Williams Field Road was taken from the Town's webpage, ([www.ci.gilbert.az.us/traffic/counts08.cfm](http://www.ci.gilbert.az.us/traffic/counts08.cfm)). The data shows the Average Daily Traffic ("ADT") for 2008 to be 12,009 vehicles per day ("vpd"). Additional data indicates the estimated ADT for the year 2025 to be 29,020 vpd. The current Level of Service ("LOS") for Williams Field Road is LOS B for off-peak hours and LOS C for morning and afternoon peak hours. The projected LOS after the proposed improvements will remain the same.

The American Association of State Highway and Transportation Officials Geometric Design of Highways and Streets, 2004, states that the LOS characterizes the operating conditions on a facility in terms of traffic performance measures related to speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience. This is a measure of roadway congestion ranging from LOS A--least congested--to LOS F--most congested. LOS is one of the most common terms used to describe how "good" or how "bad" traffic is projected to be.

The posted speed limit on Williams Field Road is 45 mph. Staff records, as well as Federal Railroad Administration accident/incident records indicate no accidents at this crossing.

Alternative routes from this crossing are as follows; to the northwest approximately 2,000 feet is Higley Road, an at-grade crossing, and to the southeast approximately one mile is Recker Road, also an at-grade crossing.

### **Train Data**

Data provided by the Town regarding train movements through this crossing are as follows:

Train Count: 6 trains per day on average (all freight trains/no passenger trains)

Train Speed: 60 mph

Thru Freight/Switching Moves: All movements through this crossing are thru freight. (No switching operations)

**Schools and Bus Routes**

The Williams Field Road crossing is within the limits of two school districts. The Higley Unified School District No. 60, and the Gilbert Unified School District No. 41. There are several schools located within a three mile radius of the crossing, they are;

**Elementary Schools:**

- ✓ Higley Elementary – 3391 E Vest Avenue
- ✓ Chaparral Elementary – 3380 E Frye
- ✓ Cortina Elementary – 19680 S 188<sup>th</sup> St.
- ✓ Eagles Aerie School – 17019 S Greenfield Rd
- ✓ Gateway Pointe Elementary – 2069 S De La Torre Drive
- ✓ Centennial Elementary - 3507 S Ranch House Parkway
- ✓ Coronado Elementary – 4333 S Deanza Blvd
- ✓ Power Ranch Elementary – 4351 S Ranch House Parkway
- ✓ San Tan Elementary – 3443 E Calistoga Dr
- ✓ Surrey Garden Christian School(k-12) – 1424 S Promenade Ln

**High Schools**

- ✓ Higley High School - 4068 E Pecos
- ✓ Perry High School – 1919 E Queen Creek Road
- ✓ Williams Field High School – 2076 S Higley

According to Mike McGuire, the Transportation Routing Coordinator for the Higley School District, there are 39 daily trips through this crossing.

**Hospitals**

The nearest hospital or health facility to the Williams Field Road crossing is as follows;

**Hospitals:**

- ✓ Gilbert Hospital – 5656 S Power Road
- ✓ Mercy Gilbert Medical Center – 3555 S. Val Vista Dr

**Health Facilities**

- ✓ Urgent Care Express – 920 E Williams Field
- ✓ East Valley Urgent Care – 641 w Warner Road

**Hazardous Materials**

The Town gave the following response when asked about hazardous materials crossing this crossing:

*No data is available for the number of vehicles carrying hazardous materials at this location.*

### Zoning

Staff requested the Town provide information regarding the type of zoning in areas adjacent to the crossing. The following was the Town's response:

*The surrounding area includes a mixture of multi-family/low density residential, Gateway Village Center, and Gateway Business Center. The area east of the crossing is currently being developed and plans have been submitted for the "Cooley Station, Village Center and Business Park".*

### Spur Lines

The Town gave the following answer regarding spur lines located in the area:

*Based on a search of the UPRR website ([www.uprr.com](http://www.uprr.com)), the only data provided for a removal of a spur line in Arizona was the line between Benson and Bisbee which was opened in 1889 and was approved for abandonment in 1996. This is not within 10 miles of this crossing.*

### FHWA Guidelines Regarding Grade Separation

The Federal Highway Administration ("FHWA") Railroad-Highway Grade Crossing Handbook (Revised Second Edition August 2007) provides nine criteria for determining whether highway-rail crossings should be considered for grade separation or otherwise eliminated across the railroad right of way. The Crossing Handbook indicates that grade separation or crossing elimination should be considered whenever one or more of the nine conditions are met. The nine criteria are applied to this crossing application as follows:

		Williams Field Road
The highway is a part of the designated Interstate Highway System	Crossing Currently meets the criteria	No
	Crossing meets the criteria by 2030	No
The highway is otherwise designed to have full controlled access	Crossing Currently meets the criteria	No
	Crossing meets the criteria by 2030	No
The posted highway speed equals or exceeds 70 mph	Crossing Currently meets the criteria	No
	Crossing meets the criteria by 2030	No
AADT exceeds 100,000 in urban areas or 50,000 in rural areas	Crossing Currently meets the criteria	No
	Crossing meets the criteria by 2030	No
Maximum authorized train speed exceeds 110 mph	Crossing Currently meets the criteria	No
	Crossing meets the criteria by 2030	No
An average of 150 or more trains per day or 300 million gross tons/year	Crossing Currently meets the criteria	No
	Crossing meets the criteria by 2030	No
Crossing exposure (trains/day x AADT) exceeds 1M in urban or 250k in rural; or passenger train crossing exposure exceeds 800k in urban or 200k in rural	Crossing Currently meets the criteria	No
	Crossing meets the criteria by 2030	No

Expected accident frequency for active devices with gates, as calculated by the US DOT Accident Prediction Formula including five-year accident history, exceeds 0.5	Crossing Currently meets the criteria	No
	Crossing meets the criteria by 2030	N/A <sup>1</sup>
Vehicle delay exceeds 40 vehicle hours per day	Crossing Currently meets the criteria	No
	Crossing meets the criteria by 2030	No

<sup>1</sup> N/A = Not Applicable

### **Vehicular Delays at Crossings**

Based on the current single track configuration, the Town gave the following response about delay time for vehicles at the crossing in this application. The delay time is measured from the point that the warning devices are activated at the crossing to the time after the train has cleared the crossing and the warning devices are reset.

*Based on 1 mile of train at 45 mph (45 mph is used in lieu of 60 mph to be conservative and more in line with an average train speed), 25 seconds of preemption time, and 15 seconds for the warning devices to reset, the average delay time per train is 1.9 minutes. At six trains per day, the average delay time is 11.9 minutes per day.*

*Based on a stopping time of 28 seconds and a time of 125 seconds to accelerate and to clear the track and 25 seconds of preemption time and 15 seconds for the warning devices to reset, the average delay time per train if a train stops on the track is 3.2 minutes. These times are based on one mile of train and charts from Railroad Engineering, Second Edition, John Wiley & Sons, Inc. 1982 (Figure 10.10 to estimate deceleration time and Figure 10.4 to estimate acceleration time to clear one mile of train).*

Current delays fall well below the FHWA recommended threshold of 40 vehicle hours delay per day.

Another commonly used measure outlined in the FHWA Guidelines; the so-called Crossing Exposure Index (which is simply the product of the number of trains per day multiplied by the number of vehicles crossing daily) is not currently met at this crossing. It should be noted that the criteria identified in the FHWA material are not mandates, but guidelines established by the FHWA, which serve to alert those having jurisdiction that potential problems may arise.

### **Grade Separation**

With regard to grade separating this crossing, the Town gave the following response:

*With the proposed improvements to Williams Field Road, the location of the at-grade crossing remains unchanged. A grade separation would have the following consequences: 1) Impact to 69kV and 230kV overhead power lines currently running parallel to the railroad. 2) Impact to underground utilities in Williams Field Road that cannot support 30 feet of additional embankment needed for a grade-separated crossing. Among these utilities are a critical 42 –*

*inch reclaimed waterline, a 16 – inch reclaimed waterline and a 24 – inch high pressure natural gas line. 3) There is insufficient right- of-way to accommodate the 20 – foot high embankment slopes along Williams Field Road. 4) There is inadequate distance between the railroad and the Lyons Gate entrance off of Williams Field Road (approximately 420 feet east of the tracks) and between the railroad and the local business entrance ( approximately 420 feet west of the tracks) to raise the roadway grade over the railroad without violating sight-distance requirements. 5) Elevating Williams Field Road would cause visual and noise impacts to the adjacent land uses, which include residential.*

Staff has utilized the FHWA Guidelines to determine the potential need for grade separation at this crossing. Based on existing conditions, the crossing in this application meets none of the nine criteria for consideration of grade separation. Additionally, future projections do not meet any of the nine criteria.

#### **Crossing Closure**

The area surrounding this crossing is highly developed with both commercial and industrial businesses. To close this crossing would have a negative affect on many of the local businesses. Therefore, Staff would not recommend closure of this crossing at this time.

#### **Staff Conclusions**

Having reviewed all applicable data, Staff supports the Town's application. Staff believes that the upgrades are in the public interest and are reasonable. Staff believes that the measures proposed by the Town are consistent with other similar at-grade crossings in the State and will provide for the public's safety. Therefore, Staff recommends approval of the Town's application.

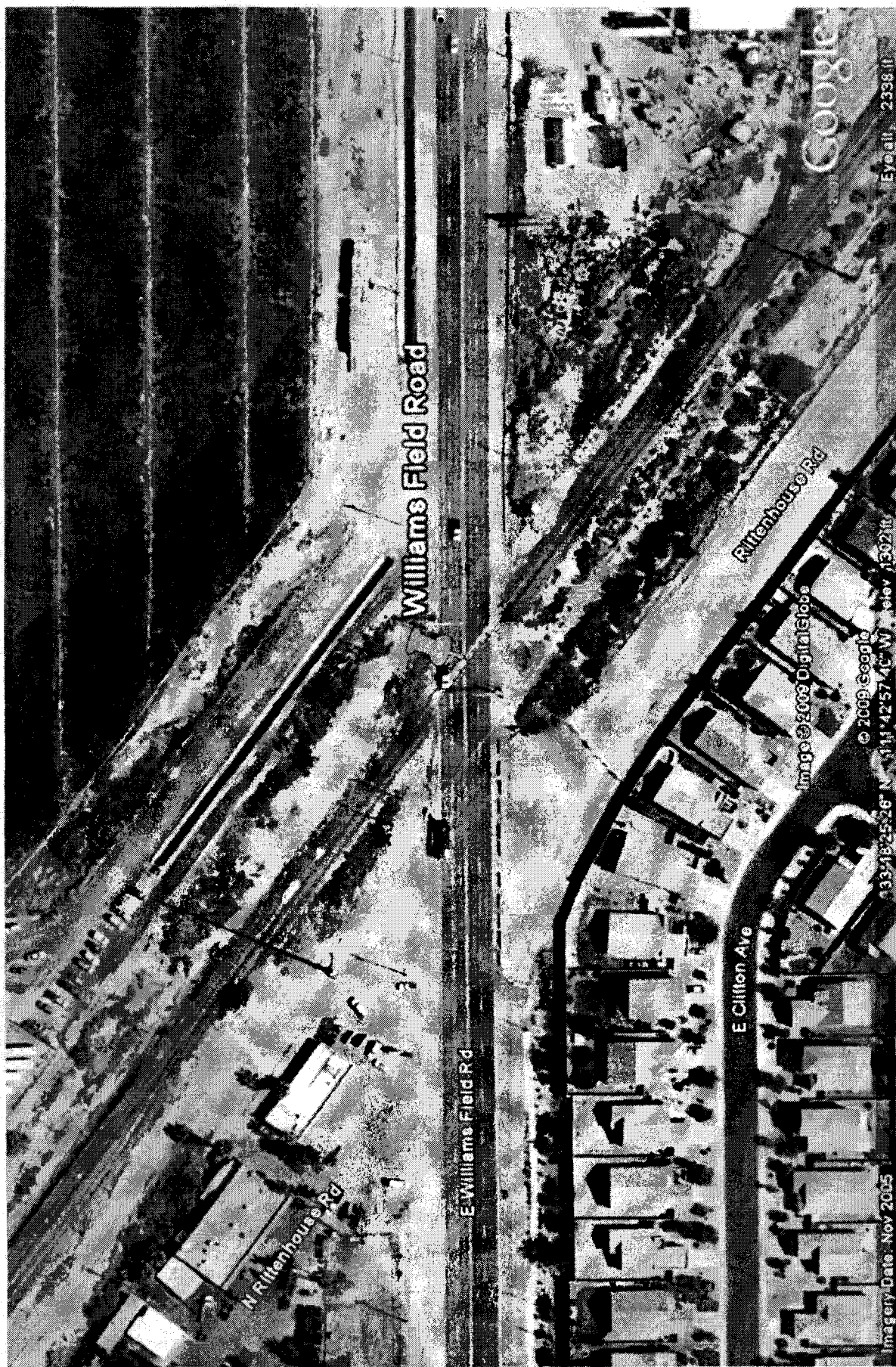


Brian H. Lehman  
Railroad Safety Supervisor  
Safety Division

Originator: BHL



## **Attachment “A”**



Williams Field Road

Rittenhouse Rd

E Clifton Ave

E Williams Field Rd

N Rittenhouse Rd

Images © 2009 DigitalGlobe

© 2009 Google

33°18'25.28" N 111°42'57.45" W Elev 1392 ft

Imagery Date: Nov 2005

Eye alt: 2338 ft

Google



Imagery Dates: Apr 12, 2005 - Nov 2005

33° 18' 18" N 111° 42' 52" W Elev: 1306 ft

Eye alt: 8953 ft

Docket No. RR-03639A-09-0430

Docket Control  
Arizona Corporation Commission  
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MCDOT  
Utility Project Coordinator  
2901 West Durango St.  
Phoenix, Az. 85009-6357